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BIOLOGICAL FRONTAL FLAPS IN OPHTHALMOLOGY

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The writer introduced biological frontal flaps to surgery over 20 years ago and has published several articles concerning this method in surgical reviews; also a book dealing with the subject. Now that it is widely known and extensively used in plastic surgery, this method may well be introduced in the field of ophthalmology.

That these flaps are of great importance for ophthalmology may be surmised from the fact that Professor Geheimrat Krückmann, director of the University Clinic of Ophthalmology in Berlin, considered the writer's work of such value to ophthalmology that half the beds of the University Clinic were put at his disposal for some years, in spite of his not being an ophthalmologist.

The biological flap has a thin pedicle containing no skin—only veins, lymph vessels, arteries, and nerves, surrounded by connective tissue. The object of the thin pedicle is to make the flap very mobile and economical to use, for no skin tissue is wasted in the pedicle.

The disadvantage of the pedicle containing skin is that the latter contains only superficial vessels which are closed when the pedicle is turned, and, as the vessels and nerves are in the loose connective tissue immediately under the skin, they are liable to compression by the skin of the pedicle, especially as the skin hardens if it is turned. The cause of this hardening is that the outer edge of the skin is stretched, the inner edge compressed.

Another disadvantage is that the skin pedicle necessitates later corrective operations, from the esthetic point of view. These corrections not only entail loss of time but are also wearisome to the patient. They moreover destroy the nourishing vessels of the flap.

Biological flaps, on the other hand, always retain their original vessels and nerves, and are sensitive from the first. Biological frontal flaps contain the frontal artery in addition to the other frontal vessels and nerves. Before cutting the flap and especially its pedicle, the artery must be located, more particularly at the point where it crosses the eyebrow; for the veins, which are even more valuable than the artery, are close to it but cannot be exactly located. The same is true of the nerves and lymph vessels. The artery can be found by exploration with the tip of the index finger, the other three fingers being placed on the skull to keep the first finger steady.

A superficial incision is now made on and along the artery just above the eyebrow. This incision should not completely traverse the skin and should continue in two incisions, lying like a roof over the vessels. The latter surround the vessels and meet underneath. The vessels must not be stripped but should remain protected by connective tissue. In this way the pedicle is created.

The flap may be of any size and shape but should always lie in the region of the artery and contain it; that is, contain also

Figs. 1 and 2 (Esser). Case 1.

the accompanying veins, lymph vessels, and nerves. The integrity of the circulation is so well assured that the flap may contain the whole skin of the forehead and even parts of the scalp, also the musculus frontalis and, when necessary, the periosteum and a piece of the bone from the tabula externa. The flap contains only the frontalis muscle in cases in which the latter is to be transplanted into paralyzed eyelids, a method introduced by the writer, as was also the method of using the frontalis muscle in cases of ptosis (Klin. M.f. Augenh., 1921, Nov., Dec.).

The easiest way of reconstructing an either partly or totally lacking eyelid is by means of an "epithelial inlay." To effect this a stent model is made of the defects that are to be covered with skin. This mold is wrapped in a thin skin graft with its outer side toward the mold. It is then placed on the wound for a week, in exactly the same position in which it was taken. To prevent secretion between wound and graft, the mold must be constantly pressed to the wound. This prevents the loosening of the already attached graft. The skin grafts are taken either from the inner side of the thigh or from the upper part of the arm. The resulting wounds heal in a few days under a dry dressing. If the technique is carried out correctly, the graft always heals completely.

But in cases in which the eyelid is totally missing, including the conjunctiva, muscles, and tarsus, the frontal flap is of the greatest value for reconstruction. Great mutilations, even those destroying the eye and the orbit, are fairly easy to repair by means of biological frontal

Figs. 3 and 4 (Esser). Case 1.

flaps. For this purpose the back of these skin flaps must first be covered with skin by epithelial inlay, in order that a supply for the conjunctiva may be provided and at the same time to avoid contraction by scar formation on granulating surfaces.

If both eyelids are to be repaired by one frontal flap, the latter is usually divided several weeks later, so as to insure the retention of the eyelids' natural position.

When both nose and eyelids are missing, a single frontal flap will supply both. The incision is made in such a manner that the flap is divided into two portions —the one for the nose perpendicularly to the eyebrow and the portion for the eyelids parallel to the other eyebrow.

Fig. 5 (Esser). Case 2.

Case reports

Case 1. B. had lost his right eye and the greater part of its lower lid, and the

Figs. 6 and 7 (Esser). Case 3.

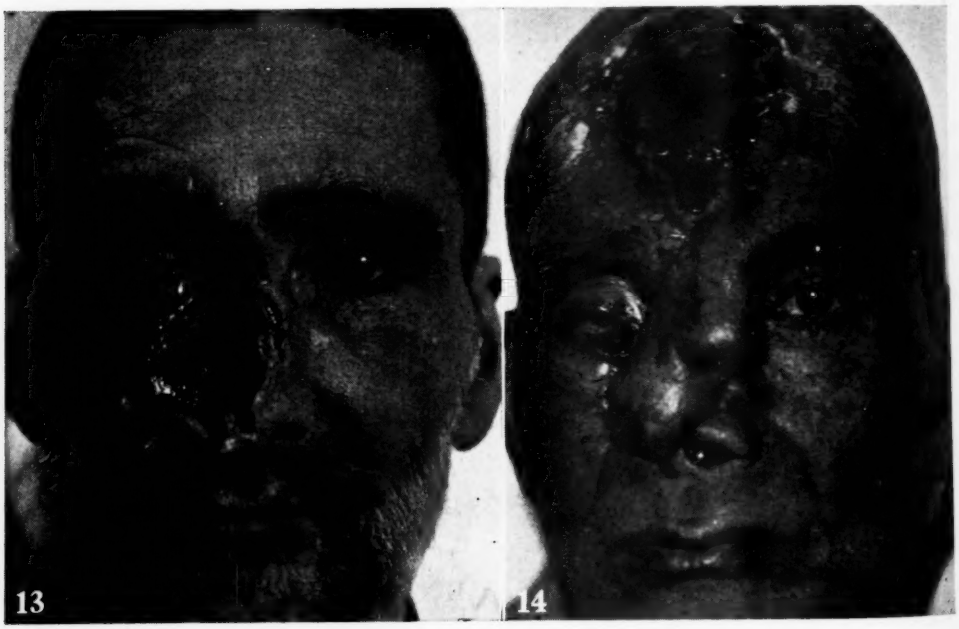
Figs. 8 and 9 (Esser). Case 3.

Figs. 10, 11, and 12 (Esser). Case 4.

left lower lid was badly damaged, entailing serious danger to the remaining eye. I began by repairing the left lower lid to obviate the danger of his losing the eye. Figures 1 and 2 show the patient as he came to me for treatment. Figure 3 shows a biological frontal flap being placed in such a way as to form the new lower lid. The scar seen on the forehead shows the site from which the flap was taken. In figure 4 corrections have been made to give a normal appearance to the lid.

Case 2. I operated on this patient (boy G.) in the Virchow Krankenhaus in Berlin, having been called in by Geheimrat Professor Borchardt. He had taken away the entire upper lid and upper part of the nose to remove a tumor. I continued his operation immediately, and by means of a biological frontal flap provided both the upper part of the nose and the upper lid, as will be seen in figure 5. I did not complete the corrections, which were simple here, as they are in every case in which there is an abundance of elastic skin tissue.

Case 3. On this case, in which the two eyelids were provided at the same time, I was called by Professor J. van der Hoeve, of Leyden University. The left eye had keratitis, due to constant ex-



Figs. 13 and 14 (Esser). Case 5.

posure (fig. 6). Figure 7 shows the frontal flap cut and placed on the eye to provide for both eyelids. This illustration clearly demonstrates that the pedicle of the flap contained no skin and was placed in a skin incision between the eyebrows. In this position the flap was maintained for many weeks to protect the affected eye and to help heal the keratitis. In figure 8 the flap is being divided into two parts, the incision running alongside the vessels of the flap to ensure an adequate circulation of blood and innervation to both lids.

As a consequence, the incision was oblique, and the palpebral fissure had to be corrected in order to make it horizontal. Figure 9 shows the direction of the fissure being changed. The lids are still swollen and will require a corrective operation at a future date.

Case 4. G. also had his lower eyelid and the upper portion of his nose restored by a biological frontal flap. Figure 10 shows the frontal flap placed on the eye; figure 11, the flap healed on the nose and the restoration of the eyelid; figure 12, the patient after healing had been completed.

Case 5. F. A., a Persian professor, was under the care of Professor Geheimrat Bier, having come to Berlin because of a cancer which had destroyed his nose, right cheek, lower eyelid, and the corresponding skeletal parts of the head (fig. 13). Professor Bier asked me to restore the damaged parts after he had removed the cancer. Prior to Bier's operation, I laid an epithelial inlay and rib cartilage on the patient's forehead. One of these pieces of cartilage was to reconstruct the bridge of the nose and the other, smaller one, the upper part of the right upper jaw. Figure 14 shows the patient after the pedicled frontal flap had been brought downward to the site of the missing nose. Figures 15 and 16 show further corrections, especially the reconstruction of the right lower eyelid and the gradual development of the nose. The lower lid was made from part of the flap, the frontal flap having provided the necessary superfluous tissue.

Figs. 15 and 16 (Esser). Case 5.

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THE EFFECTS OF OXYGEN DEPRIVATION ON THE CENTRAL VISUAL FIELD

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Through previous communications one of us has reported the effects of oxygen deprivation on cortical functions during exposure to simulated high altitudes in low-oxygen and low-pressure chambers at sea level,[1] as well as during prolonged residence at high altitude in the Chilean Andes.[2] These studies have shown that the efficiency of sensory and mental functions depends upon the amount of oxygen being delivered to the nervous tissue. The other author has reported the characteristics of the normal and pathological angioscotoma (the partially blind area of the visual field due to a shadow corresponding in form to the retinal vessels** as they emerge from the optic disc.[3, 4] The present investigation is concerned with the variations in sensitivity in the central visual field, measured in terms of the angioscotoma area, resulting from modifications of the amount of oxygen in the inspired air. It was assumed that such an investigation might be of interest since it has been demonstrated clearly that anoxemia alters certain characteristics of the visual processes and also because the angioscotoma technique offers a precise method of measuring some phases of these changes.

The air that is inspired at sea level contains 20.96 volumes percent of oxygen (O_2), 79 percent of nitrogen (N_2), 0.04 percent of carbon dioxide (CO_2), and minute percentages of the inert rare gases, argon, neon, xenon, krypton, and helium. This assumes that the air is dry. If one ascends to a high altitude, as in a balloon or airplane ascent, the most important changes in the environment are the diminished barometric pressure and the consequent decrease in the partial pressure of oxygen (the percentage of O_2 remaining constant; that is, 21 percent, at all levels) and lowered temperature and humidity.

The original contention of Paul Bert[5] has been verified by subsequent research,[6] that the important factor in high altitude that causes the abnormal symptoms in the organism is not the diminution in mechanical or *total pressure* but in the diminished *partial* pressure (or concentration) of the atmospheric oxygen and the consequent decrease in the alveolar-air and arterial-oxygen saturations. At any altitude, therefore, a given volume of air contains less weight of oxygen than at sea level, in which case the blood takes up less oxygen. This means that at 18,000 feet, when the barometric pressure falls approximately 50 percent, a given breath of air will supply only one half as much oxygen as at sea level. One can create the essential conditions of high altitude at sea level, therefore, by having

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The authors wish to express their indebtedness to The Linde Air Products Company for supplying the nitrogen used in this experiment.

** It is important that the reader be impressed with the fact that the angioscotoma in health and disease is the projected defect of the retinal perivascular space system and does not represent a projected shadow of a retinal vessel.

a subject breathe gas mixtures low in oxygen content. If one rebreathes a certain amount of air until the oxygen falls from 21 to 7 percent, it is equivalent—that is, it will bring about approximately the same physiological and psychological effects in the organism—to ascending rapidly from sea level to an altitude of 30,000 feet.[7]

The most important physiological changes associated with a diminution in the partial pressure of oxygen are: (a) stimulation of the respiratory center and an increase in the pulmonary ventilation; (b) a decrease in the alveolar-oxygen and carbon-dioxide tensions; (c) dilatation of the alveoli favoring a more efficient respiratory exchange; (d) an initial increase in the heart rate and blood pressure and an increase in cardiac output, followed by a gradual return to normal while at rest; (e) an increase in the amount of hemoglobin in the circulation; (f) a decrease in the arterial-oxygen saturation associated with the fall in alveolar-oxygen tension; and (g) changes in the acid-base equilibrium—the initial effect being one of alkalosis associated with the excess elimination of carbon dioxide. Sudden and extreme anoxemia depresses the activity of the respiratory center so that a delayed effect may be the retention of carbon dioxide and consequently an acid reaction in the blood.

The severity of the reactions to high altitude is dependent upon the following variables: (1) the height attained; (2) the rate of ascent; (3) the length of the sojourn; (4) the amount of physical exertion; and (5) the physical characteristics of the individual, such as age, physical fitness, tolerance due to repeated ascents, and the amount of fatigue, sleep, alcohol, and so forth, previous to the experiment or ascent.

The psychological changes follow closely the severity of the physiological alterations, indicating that sensory and mental functions appear to depend directly upon the velocity of certain chemical ones in the nervous tissue; in this case, the oxidative processes. At 12,500 feet, the psychological impairment is sufficiently great to be objectively measured by sensory and mental tests, especially those that cannot be compensated for by exerting greater effort. The average person may be subjectively aware of certain physiological impairment, such as alteration in respiration, headache, motor incoordination, increased distractibility, or lethargy. If the anoxia is produced suddenly and reaches an advanced stage, simulating altitudes of 20,000 to 23,000 feet, the effects may be insidious and completely unobserved subjectively, as in some cases of alcoholism. In these more advanced stages of anoxia, there is marked impairment in judgment, in memory, in emotional stability, and in the special senses, hearing being the last to be affected.[1]

During the Chilean Expedition (1935) significant changes in acclimatized subjects were observed at 15,440 feet and 17,500 feet altitude, where the oxygen saturation of the arterial blood (10 subjects) averaged 80 percent and 76 percent, respectively. The impairment in the psychological tests at 20,140 feet during this expedition, at which time the average arterial-oxygen saturation dropped to 65 percent, was not so extreme as anticipated in comparison to data obtained under simulated conditions at sea level in unacclimatized man.[2]

The effects of oxygen lack on certain visual functions were studied extensively by Wilmer and Berens[8] in testing pilots for high-altitude flying during the World War. Standard visual tests were given to large numbers of normal and defective subjects in the low-pressure chamber as well as on the rebreathing apparatus. The results obtained with both techniques were practically the same. The tests indi-

cated that under anoxia there was diminished visual acuity, constriction of the visual fields, reduction in retinal sensitivity, changes in the heterophorias, and increased fatigability of the muscles of accommodation and convergence. There were no significant effects at 10,000 feet; however, at 15,000 feet there were slight deficiencies in certain visual functions, while at 20,000 feet or over the impairment was very marked. Upon administering oxygen at these levels, normal performance would return within a few minutes. Sauer[9] in similar experiments obtained practically identical results. The authors conclude that these visual defects at simulated high altitudes are due to the lack of oxygen and that these reactions can be avoided while in flight by breathing oxygen. They observed that high altitude affected those with subnormal vision much more than it did the normal ones. In fact, McComas[10] reported that the experiments on pilots with oxygen deprivation exaggerated to a marked degree any existing eye defect and unmasked a preëxisting condition which would have otherwise eluded detection.

The effects of anoxemia on ocular movements while reading and during steadiness fixation have been studied with photographic techniques by McFarland, Knehr, and Berens.[11, 12] At simulated altitudes of 13,500 feet and 18,000 feet, an increase in reading time was observed, with a larger number of fixations at the higher altitudes. There was a general tendency toward diminished precision in the adequacy of the ocular fixations both in subjects with normal vision and in patients with motor anomalies. Since this procedure appears to be free from the effects of increased effort, which in many tests masks the effects of mild degrees of anoxia, the authors suggest that this technique is a sensitive measure of the impairing effects of oxygen lack on an unconscious and well-established motor habit, as well as a helpful procedure in diagnosing certain patients with motor anomalies. The increased fatigability of the ocular muscles was observed during the Chilean Expedition even in acclimatized subjects at 15,440 feet and 17,500 feet, with an ocular ergograph.

The effects of oxygen want are manifested not only in impairment of the ocular muscles, but also in certain fundamental aspects of the visual mechanism itself. Under anoxia there is a depression of vision manifested not in the blurring of outlines, but in a general darkening of the visual field, and under acute conditions an intermittent cessation of all visual experiences.[13] Numerous observers have reported the general darkening of the visual field, and pilots have observed the same phenomena at very high altitudes. Under controlled conditions Goldmann and Schubert[14] found a considerable decrease in the distinction threshold for brightness, and experiments with the Reeves Wedge have objectively demonstrated impairment in light sensitivity.[15, 16] Under acute oxygen want a lengthening of the latent period of negative afterimages was observed by Gellhorn[17] and at times even complete absence of any afterimages. In subjects acclimatized to high altitudes on the Chilean Expedition, McFarland[2] found variations in the negative afterimage at 17,500 feet and 20,140 feet. Even though certain visual functions are impaired at moderate altitudes, the average subject does not lose the capacity to see and react to objects until very extreme oxygen want is present. In fact in rebreathing experiments, visual acuity, as in reading a meter or observing the form and shape of objects, persists until the advanced stages of anoxia.

Various methods have been devised for studying at sea level the effects of oxygen want on human behavior. In a vacuum or low-pressure chamber the atmospheric conditions of high altitude can be exactly reproduced. Because it has been

repeatedly demonstrated from the time of Paul Bert to the present day that the most important effects of high altitude are produced by the diminished partial pressure of oxygen available for the body, the essential conditions can be simulated in low-oxygen chambers and rebreathing devices, or with a Douglas bag. In the rebreathing experiment the subject breathes over and over again the same air so that the percentage of oxygen is gradually reduced (carbon dioxide absorbed by soda lime). With the Douglas bag, the oxygen corresponding to the altitude for the experiment can be simulated by running in nitrogen through a gas meter, thereby reducing the percentage of oxygen to the desired amount. Similarly, in the low-oxygen chamber the oxygen percentage is diminished by replacing it with nitrogen. If one wished to experiment at a simulated altitude of 19,000 feet, for example, the oxygen would be replaced by nitrogen until it was reduced from 21 to 10 percent, or the approximate percentage available for the organism at that altitude. In experiments involving visual or psychological tests, the chamber method is desirable so that the subject may be free from the distraction of the mouthpiece or face mask.

Characteristics of the angioscotoma. The angioscotoma was originally described as a defect which *seemed* to be the projected shadow of the retinal vessels as they emerge from the optic disc.[3] It was soon found that this simple conception was not tenable, as certain aspects of the phenomena elicited could not be adequately explained on a simple vessel-shadow basis. The name "angioscotoma" should be used to indicate a defect of the visual field originating from the blind spot of Mariotte and related in form and characteristics to those of the retinal-vessel tree. After numerous studies, including the histology and physiology of the retinal vessels and adjacent structures, it was postulated that these shadows arose through modifications of the retinal perivascular-space functions and ultimately through the responses of the synapse functions between the rod-and-cone layer and the bipolar-cell layer, and between the bipolar-cell layer and the ganglion-cell layer of the retina.[18]

Without attempting to outline all the characteristics of the angioscotoma, the "widening phenomenon" should be emphasized. When any influence, ocular or systemic, brings about slowing of the blood stream in the retinal vessels, the angioscotoma widens. This widening phenomenon also occurs in other conditions, explanation of which is rather involved. The reader is referred to the bibliography of angioscotometry for further discussion of this point.[3, 4, 18–24]

The following are some of the conditions associated with widening of the angioscotoma: (1) pressure on the eye that is being mapped; (2) pressure on the opposite eye; (3) holding the breath; (4) while the head is maintained at a lower level than the body; (5) with fright; (6) during the menstrual period; (7) with general fatigue; (8) with low blood pressure; (9) with pressure obstruction of the jugular veins; (10) with change of posture; (11) with general circulatory insufficiency; (12) with increased intracranial pressure; (13) with various systemic diseases; (14) with local ocular diseases; (15) after the use of certain general medication; (16) after the use of local (ocular) medication.

*The technique of angioscotometry.** The area of the scotoma is determined by a method previously devised.[24] It permits a quantitative statement of the field defect in such form that the results may be tabulated or set forth in a graph. The following description is taken from a previous report:

Since the area of projected retina studied on

* For a complete discussion of the subject of angioscotometry, cf. Evans, John N. "An introduction to clinical scotometry," Yale University Press, New Haven, 1938.

the stereocampimeter represented but a small portion of the whole field, one could not state the result in terms of percentages of field losses. It was therefore decided to select a limited area of the campimeter chart, an area to which the classical defects are for the most part limited, and an area as free from the 'scotoma of physiologic edema" as possible. To this end, a "window" was cut in a black campimeter chart and superimposed upon the map to be measured. The area of the defect appearing within this window alone was to be gauged. The "window" was so arranged that its nasal edge passed through the fixation point, its upper edge coincided with the 15-degree line, its temporal edge with the 25-degree line, and its lower edge with the 15-degree line.

The Universal Map Measure** was used in the following way.† The wheel of the instrument was caused to trace the 1 degree vertical markings on the chart over those regions of the scotoma included within the limits of the "window." In other words, vertical measurements were made of the scotoma every degree of its surface. The meter records in centimeters and fractions. No effort was made to express the results in centimeters of area, since the object of the study was merely to arrive at an understanding of the relative variations in the size of the defects.‡[24]

The following technique, as described elsewhere,[20] was followed:

1. It is understood that the usual precautions for control of position, comfort, distractions, and so forth, are taken.

2. Distant correction should, as a rule, be worn.

3. The stereocampimeter and Lloyd chart are advocated. If both eyes are used (binocular fixation), the muscle balance should be checked and corrected by the instrument. Monocular fixation is very satisfactory, a blinder covering the eye not in use.

The monocular method was used in the present studies.

4. The lamp§ used is one especially designed to give shadowless illumination, standardizable and uniform in color and quality, supplying an intensity of 15 ft-c measured on the slate with the General Electric Company's foot-candle meter.‖ It is so attached that the light maintains the same relation to the slate during adjustments of the instruments, and is passed through a bluish ground glass to give the quality of daylight.¶

5. The method of signaling is usually by tapping.

6. Markings are made with light colored fine wax pencils (of the newer metal magazine type) directly, instead of being copied from the slate on white records. This method reduces time and effort about 50 percent.

7. The subject is allowed to close his eyes frequently, but must not change his position.

8. The blind spot is outlined as usual by passing from the seeing to the non-seeing area, and a line connecting the dots is then drawn.

9. The object†† is next moved around the periphery of the blind spot, a millimeter from it, until it suddenly disappears, when a dot is marked. This place is then approached from the opposite direction and at right angles to the supposed course of the vessel but at about 2 mm. further from the edge of the blind spot and its point of disappearance noted again. Alternate sides are thus plotted, each point being about 1 mm. in advance of the preceding. In this way branching and cross-vessels are not missed, and the twistings and widenings are easily followed. As the object is approaching the vessel, it should be given very fine movements parallel to the vessel. While this mo-

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** Keuffel & Esser Company, New York, No. 1692.

† A device called a planimeter is available, which enables one to determine the area of an irregularly shaped surface, but such a device is too expensive to find a place in clinical scotometry. In the hope that the evolution of a practical method might be established, this device and technique were evolved.

‡ "It is obvious that the reading as indicated by the map measure, when used in the manner above described, could not be stated as representing centimeters of area. Since the method has a possible application to the measurement of any scotoma, we have coined the term 'scotoma unit' for our reading.

"If vertical measurements (in centimeters) of a scotoma are made at 1 degree intervals, their sum may be stated as 'scotoma units.' A scotoma unit would thus be a variable which would bear a relation to the fixation distance (projection of 1 degree upon a tangent surface)."

§ Mechanical construction by J. H. Penny, 144 Joralemon Street, Brooklyn, New York.

‖ Edison Lamp Works of General Electric Company, Harrison, New Jersey.

¶ As used by Bausch & Lomb in their Ives Visual Acuity object.

†† The tip of a fine, pure silver wire (.12 mm. in diameter) is thrust momentarily into the flame of a Bunsen burner. The silver melts and forms a minute sphere (.25 mm. to 1.5 mm. in diameter) upon the end of the slender stem. The sphere is rendered white by immersion in hydrochloric acid. The stem is blackened with India ink. A handle can be attached and the sphere size determined by means of a micrometer.

tion is not essential, it does not detract from the technique and meets objections that would otherwise be heard from the exponents of that school which likes to use the expression 'retinal fatigue."

10. If a crossing vessel is picked up far out, it can be traced in a similar way to the nerve head, but it is more difficult to locate a vessel far out in the field without having been led to it while mapping.

11. The patient may rest as often as necessary; but each time work is resumed, one or two points of the map should be checked until the new plot coincides.

The subjects used in these experiments were in good health and had recently undergone careful physical and ophthalmological examinations* in order to establish their fitness for these experiments. They had all been under observation for at least a year, an opportunity being thus afforded to observe any personal peculiarities which might have rendered them unfit subjects. They were trained in other experiments involving oxygen deprivation, and were therefore acquainted with the experimental procedures.

The experimental procedure

In this experiment the tests were given in a Barach portable oxygen chamber (7 by 8 by 8 feet) where the gases, temperature, ventilation, and humidity could be regulated.[25] The concentration of oxygen was maintained at the desired percentage by running in nitrogen. The carbon dioxide never exceeded 0.7 percent. Samples of the gas mixtures were taken by an assistant from the outside of the chamber and analyzed with a Haldane gas-analysis apparatus. These determinations were made at the beginning and end of each period when the percentage of oxygen was altered. The ventilation was provided by a motor blower unit. The air current was passed through a tank which contained ice to cool and dry the air. The temperature was maintained between 65 and 70°F., and the humidity between 40 and 50 percent. The chamber was in a part of the laboratory free from distractions and other outside influences. The experimenter was protected against the effects of anoxia by breathing additional amounts of oxygen through a nasal catheter. The small change in percentage of oxygen was compensated for by a small amount of nitrogen from a cylinder outside the chamber.

Each subject was studied individually in the chamber during an experimental period of approximately one hour. An attempt was made to plot the scotomas at three different stages of oxygen deprivation corresponding to 13,000 feet, 17,000 feet, and 21,000 feet,** with control observations in air before and after the experimental tests.

Results

The physiological tests. A time record was kept continuously as each step of the examination began and ended. The pulse rate and blood pressure were recorded at frequent intervals (cf. tables 1 to 4). Samples of alveolar air were taken for determination of the partial pressure of oxygen and carbon dioxide in the lungs at the same time that a sample of air was obtained from the chamber. As shown in figures 1 to 4, these determinations were made at the intervals to correspond to the periods when the oxygen percentages were altered. Notes were also kept of each subject's general reactions and alterations in behavior (cf. tables 1 to 4).

The ophthalmological examination. Visual acuity was taken on each subject

* The details of the ophthalmological examination of each subject may be found in this Journal, 1937, v. 20, no. 12, December, p. 1207.

** The altitudes corresponding to the oxygen mixtures in the chamber were determined by data compiled by the U. S. Bureau of Standards which relate altitude, barometric pressure, and the percentage of oxygen available for the organism at each level. The calculations are based upon a constant temperature of 15°C., with allowance for the day-to-day variations in the barometric pressure.

TABLE 1

THE ANGIOSCOTOMA (SUBJECT—L. R.) IN OXYGEN DEPRIVATION

Chart	Time since entering chamber in minutes	Equivalent altitude in feet	Composition of air breathed by subject		Gas pressure alveolar air of subject in mm. Hg		Pulse rate per minute	Blood pressure in mm. Hg	Size of pupils in mm.	Visual acuity (Snellen) 5 ft-c ill.	Plotting time in minutes	Area of scotoma in scotoma units	Remarks
			% O_2	% CO_2	pO_2 mm.	pCO_2 Hg							
I-r*	0	Sea level	20.96	0.04	98.8	40.1	88	106/58	4	20/15 −1	12	42.5	Full fields—Schweigger perimeter 3/170 20 ft-c
I-l*	0	Sea level	20.96	0.04	102.1	40.0	88	106/58	4	20/15	12	65.0	Full fields—Schweigger perimeter 3/170 20 ft-c
II-r	13	14,000	12.23	0.18	54.4	32.9	103	117/68	n.t.	20/15 −1	3	48.0	
II-l	17	14,000	12.23	0.18	54.0	32.0	103	117/68	n.t.	20/15	3	107.0	
III-r	30	19,000	10.04	0.29	n.t.	n.t.	104	108/70 est.	n.t.	20/15 −2	5	84.0	No field changes
III-l	35	19,000	10.04	0.29	n.t.	n.t.	104	108/73	n.t.	20/15	4	176.0	No field changes
IV-l	41	21,500	9.20	0.40	32.6	28.9	100	n.t.	5	n.t.	3	224.0	Patient semistuporous
V-r	48	Sea level	20.96	0.04			72	n.t.	4	20/15 −4	4	55.0	Peripheral fields unaffected
V-l	55	Sea level	20.96	0.04			72	n.t.	4	20/15	3	76.0	Peripheral fields unaffected

* r—O.D.
l—O.S.
n.t.—test not taken.

All plottings made with $\frac{.40}{190}$ under 20 ft-c illumination (Weston Sight Meter).

on the Snellen chart illuminated by 5 ft-c at various intervals during each experiment. The results are shown in tables 1 to 4.

Pupillary measurements were taken at frequent intervals. For this purpose, the illuminating lamp of the stereocampimeter was tipped to cast its light directly into the face of the subject from a distance of 14 inches.** A special pupillometer was used which avoided the error of parallax in reading the scale. No signifi-

** At the position where the patient's eye was placed for this measurement, the General Electric Company's Foot-Candle Meter recorded 20 ft-c.

TABLE 2

THE ANGIOSCOTOMA (SUBJECT—C. K.) IN OXYGEN DEPRIVATION

Chart	Time since entering chamber in minutes	Equivalent altitude in feet	Composition of air breathed by subject		Gas pressure alveolar air of subject in mm. Hg		Pulse rate per minute	Blood pressure in mm. Hg	Size of pupils in mm.	Visual acuity (Snellen) 5 ft-c ill.	Plotting time in minutes	Area of scotoma in scotoma units	Remarks
			% O_2	% CO_2	pO_2 mm.	pCO_2 Hg							
I-r	0	Sea level	20.96	0.04	103.9	38.5	75	118/65	3.5	20/15 +3	15	39	Control test before artificial atmosphere
I-l	0	Sea level	20.96	0.04	103.9	38.5	75	118/65	4.0	20/15 +3	12	42	Control test before artificial atmosphere
II-r	5	8,000	14.35	0.10	n.t.	n.t.	80	117/62	3.5	20/15 +3	10	41	Very slight narrowing of scotoma
II-l	7	8,000	14.40	0.12	n.t.	n.t.	80	117/62	4.0	20/15 +3	11	36	Very slight narrowing of scotoma
III-r	15	13,000	12.78	0.19	n.t.	n.t.	86	111/67	n.t.	20/15 +2	3	41	
III-l	18	13,000	12.78	0.19	54.2	34.1	80	102/61	n.t.	20/15 +3	5	36	
IV-r	26	17,000	10.90	0.28	n.t.	n.t.	87	102/61	n.t.	20/15 +3	6	114	Marked change in scotoma (suddenly) while being held at 16,500 feet
IV-l	36	17,000	10.80	0.30	n.t.	n.t.	90	102/61	n.t.	20/15 +4	5	102	
V-l	50	22,000	8.93	0.31	32.9	26.9	89	96/57	4.0	20/15	6	142	
VI-l	72	Sea level	20.96	0.04	n.t.	n.t.	84	95/67	4.0	20/15	6	51	Out of chamber 12 minutes, breathing mixture of: O_2, 93%; CO_2, 7%. No change in eyegrounds noted

TABLE 3

THE ANGIOSCOTOMA (SUBJECT—M. K.) IN OXYGEN DEPRIVATION

Chart	Time since entering chamber in minutes	Equivalent altitude in feet	Composition of air breathed by subject		Gas pressure alveolar air of subject in mm. Hg		Pulse rate per minute	Blood pressure in mm. Hg	Size of pupils in mm.	Visual acuity (Snellen) 5 ft-c ill.	Plotting time in minutes	Area of scotoma in scotoma units	Remarks
			% O_2	% CO_2	pO_2 mm.	pCO_2 Hg							
I-r	0	Sea level	20.96	0.04	98.5	41.7	80	118/79	4	20/15 −1	10	25	Fields normal—3/170 20 ft-c
I-l	0	Sea level	20.96	0.04	98.5	41.7	80	118/79	4	20/15 −2	10	23	
II-r	14	13,000	12.60	0.23	n.t.	n.t.	82	112/80 est.	4	20/15 −2	6	25	
II-l	21	13,000	12.60	0.23	n.t.	n.t.	90	113/83	4	20/15 −1	4	54	
III-r	29	17,000	10.64	0.32	38.1	34.3	92	110/80 est.	n.t.	20/15 −1		57	Fields not affected
III-l	35	17,000	10.64	0.32	38.1	34.3	92	110/80 est.	n.t.	20/15 −1		118	
IV-r	54	22,400	8.69	0.35	n.t.	n.t.	114 irr.	125/74	4	20/15 −1	7	138	Patients semistuporous No field charts made
V-l	59	Sea level	20.96	0.04			80	125/90	4	20/15	6	27	Gasping and nervous while inhaling O_2. No fundus changes

cance was attached to these readings, as they were taken only on account of the possible influence which wide variations of pupillary diameter are known to have on angioscotometry. Pupillary variations of a significant amount were not encountered in preliminary experiments, so that they are only recorded occasionally (cf. tables 1 to 4).

Perimetric studies were made with the Schweigger hand perimeter, using a white disc of 3 mm. diameter as the object. Uniform illumination was provided which measured 20 ft-c on the arc. This test was arranged to simulate conditions most commonly met with in the average clinic. We feel sure that could refined methods be applied, peripheral-visual-field studies would be very productive. No attempt was made to use the improved types of perimeters in this study (nor was an attempt made to study intraocular pressure), as the routine steps in the examination were already so elaborate as to re-

TABLE 4

THE ANGIOSCOTOMA (SUBJECT—R. MCF.) IN OXYGEN DEPRIVATION

Chart	Time since entering chamber in minutes	Equivalent altitude in feet	Composition of air breathed by subject		Gas pressure alveolar air of subject in mm. Hg		Pulse rate per minute	Blood pressure in mm. Hg	Size of pupils in mm.	Visual acuity (Snellen) 5 ft-c ill.	Plotting time in minutes	Area of scotoma in scotoma units	Remarks
			% O_2	% CO_2	pO_2 mm.	pCO_2 Hg							
I-r	0	Sea level	20.96	0.04	103.0	37.8	74	115/77	3	20/15 +5	14	31	Control test before artificial atmosphere
I-l	0	Sea level	20.96	0.04	103.0	37.8	74	115/77	3	20/15 −2	12	43	Control test before artificial atmosphere
II-r	8	8,000 appr.	15.40	0.10	n.t.	n.t.	84	112/65	3	20/15 +5	3 appr.	31	
II-l	8	8,000 appr.	15.50	0.14	n.t.	n.t.	84	112/65	3	20/15 −2	3 appr.	42	
III-r	18	13,500	12.36	0.16	47.2	35.5	85 est.	127/77	n.t.	20/15 +5	10	20	Note scotoma shows narrowing at this stage
IV-r	30	17,000	10.60	0.30	38.5	34.2	90	115/64	3	20/15 −1	5	52	
V-r	45	20,500	9.23	0.42	29.7	32.5	98	136/74	4	20/15 −1	5	76	
V-l	51	20,500	9.23	0.42	29.7	32.5	98	136/74	4	20/15 −3	4	84	Subject semistuporous Necessary to arouse vigorously to get responses.
VI-l	54	Sea level	20.96	0.04	n.t.	n.t.	70	117/79	4	20/15	6	43	3 minutes after patient had been breathing (chamber open) mixture of: O_2, 93%; CO_2, 7%. No fundus changes

quire all available time for their completion before the subject became too incapacitated to coöperate. Suffice it to say that under the conditions employed, perimetric studies were nonproductive. It is obvious that the technique of angioscotometry described above gives valuable central-visual-field data, and it should be recognized as a refined form of perimetry.

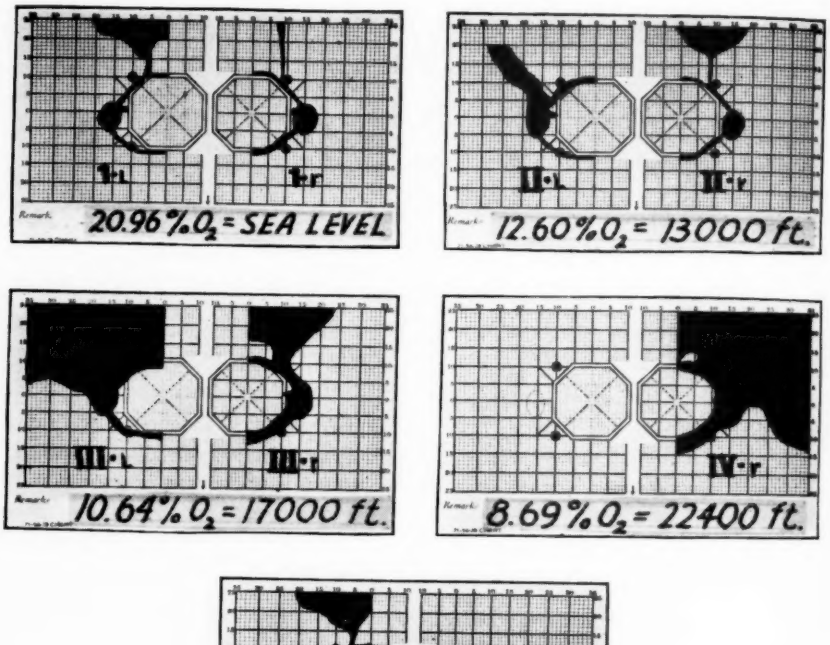

Fig. 1 (Evans and McFarland). Typical scotoma study: subject—M. K. (cf. table 3).

The eyeground examination. The direct method of ophthalmoscopy was used frequently during the experiments and every effort made to discover changes. The examination, made through an undilated pupil, elicited very few changes. At each examination the same area of retina was studied. This was selected during the examination in air and included a crossing artery and vein with fine vessels within the same field. But one change was noted. During the height of anoxemia the colors of the artery and the vein approached one another; but there was never a time when they were difficult to distinguish. When oxygen was being inhaled at the end of the experiments, the artery assumed its characteristic color. The effect, however, was not dramatic in its contrast. There was no suggestion of marked vasodilation or constriction, though one might be misled to think so in those subjects who showed slight evidence of general cyanosis. There were no evidence of arterial alteration and no signs of edema or hemorrhage. It is possible

that edema and other changes would have been ophthalmologically visible, had the subjects remained under chamber conditions for longer periods.

The angioscotoma examination. The variations in the size of the scotoma in terms of scotoma units are shown in tables 1 to 4 and graphically for subject M. K. in figure 1.

The plotting time was recorded in each case in an attempt to discover any relationship of "the rate of ascent" and "the rate of adjustment" at a given altitude to the development of the widening of the scotoma (cf. tables 1 to 4.). As far as could be determined, the changes in the scotoma were gradually progressive, once they started, and did not seem to show regression during the time when "the ascent" or variations in oxygen percentage was halted.

In this investigation, the uninfluenced angioscotoma was plotted first in the region in which previous experience had suggested it might be most productive. It will be noted from the tables that little or no change became evident until the oxygen had been withdrawn to correspond to the level in the neighborhood of 13,000 feet. A slight narrowing of the scotoma was often noted as a preliminary to the widening. This was observable since the mapping was done at such frequent intervals that the angioscotoma was almost continually under observation, and recorded only when noteworthy changes appeared.

When the widening effect of the scotoma started it was apparently progressive with increasing oxygen deprivation, until at the highest simulated altitudes the visual field for the stimulus object was completely obliterated except for a region 8 degrees to 10 degrees about the macula (cf. figure 1). The return to normal was complete within five minutes after inhalation of normal concentrations of oxygen.

In accord with the procedure described above, the scotoma areas have been expressed in scotoma units as shown in tables 1 to 4. There appears to be direct relationship between the extent of the area of the scotoma and the diminished partial pressure of oxygen in the chamber, as well as in the alveolar oxygen (cf. tables 1 to 4).

It is very significant that the visual acuity remained relatively unimpaired, although in the advanced stages of oxygen deprivation the subjects were severely affected and at times almost stuporous, and when the angioscotoma had practically obliterated the entire visual field.* An area of 8 degrees to 10 degrees about the macular region seemed entirely uninfluenced even in those cases in which the angioscotoma showed the most marked changes. One may conclude that the corresponding region in the retina appears to be unusually resistant to the effects of oxygen deprivation.

Discussion

The outstanding result of this investigation is the increase in the size of the angioscotoma with progressive oxygen deprivation. Although the data are insufficient to establish a quantitative relationship between the diminution of the partial pressure of oxygen in the alveolar air and the area of the defect, there is sufficient evidence to show that in every person studied there was a progressive loss in the visual field with increasing lack of oxygen.

Although the widening changes of the

*With "increasing altitudes" it became more and more difficult to collect reliable data. It was not always possible to map the scotoma of each eye. No questionable finding was accepted, but occasionally estimates were made when previous experience had demonstrated an error of less than 0.1 percent. Estimations are indicated in the appended data.

angioscotoma may arise from a wide variety of causes, as indicated above, every effort was made to control these factors. Since all the subjects had served in low-oxygen experiments very frequently, the possibility of disturbing emotional effects or apprehensiveness was very slight. Changes in total pressure* were not involved, as would be the case in ascents to high altitude by airplane or train. Numerous studies of cerebral circulation have shown that oxygen lack produces vasodilatation and increased blood flow.[26, 27] However, a deficit of oxygen occurs in the tissues in spite of these compensatory reactions. The frequency of headaches under anoxia suggests that cerebral edema and increased intracranial pressure may result from oxygen lack. In these experiments, however, there appeared by ophthalmoscopic examination to be no change in size in the retinal vessels nor edema of the retina.

The most plausible explanation appears to be related to the deficiency of oxygen reaching the retina in those regions corresponding to the defect. One of us has postulated[23] that the angioscotoma may be explained on the basis of dysfunctioning of the synapses in the retina due to lack of oxygen. The findings of this investigation seem to add support to this hypothesis.

Since the eye is such a complex structure and in so many ways essentially a part of the brain, it is interesting to consider the data obtained from this study of the effects of oxygen deprivation on the eye in relation to function of the brain. It is recognized that the brain is particularly sensitive to oxygen lack and that certain parts of the cortex are apparently more sensitive than others.[28] From this investigation it appears that certain areas of the retina likewise vary in sensitivity to anoxia; that is, the area around the macular region. One might have assumed that the macula itself would be well supplied with oxygen because of its intimate relation to the choroidal blood bed, but this could hardly be a complete explanation for a like resistance of the retina 5 degrees or 10 degrees about the macula. This 10-degree area is perhaps a significant zone in other respects, since it closely corresponds to that region of the retina where there are about equal numbers of rods and cones (cf. Osterberg's Graph. Acta Ophth., 1935, v. 13, Supplement 6).

The implications of this study are not only of theoretic interest in relation to the role of oxygen in visual processes, but certain clinical applications are also apparent. By placing a patient under the stress of oxygen deprivation, latent defects in the retina may become apparent. This may be of special interest in the selection of air pilots. But even more significant is the fact that the loss of vision in glaucoma follows very closely the features of the angioscotoma of the normal retina under oxygen deprivation, suggesting that oxygen inhalation or drugs which tend to increase oxidation in the tissues might be indicated.

In numerous conditions associated with venous stasis, widening defects of the angioscotoma identical in form and extent to those created in these experiments have been eradicated by the administration of drugs—ephedrine sulphate—which cause vaso-constriction and a rise of blood pressure. The administration of similar medication might be used to over-

* In a recent series of experiments in the low-pressure chamber at Wright Field, H. G. Armstrong has observed an increase in intracranial pressure in goats of 400 percent at 25,000 feet. The needle was put into the cisterna magna. The increase appeared to be significant at 16,000 feet and above. No variations in the curve were demonstrable by the inhalation of adequate amounts of oxygen to compensate for the deficit (personal communication to the authors).

come the visual and cerebral effects of anoxia in aviators.

Conclusions

The following conclusions, in the order of their significance, may be drawn from these 36 experiments on 8 eyes of 4 subjects under the conditions of oxygen deprivation as indicated: (1) Central visual acuity remained unaffected, even at the peak of oxygen deprivation; (2) the angioscotoma widens progressively with progressive oxygen deprivation until it obliterates the visual field except for a region 8 degrees to 10 degrees about the macula; (3) there seemed to be no relation between the minor blood-pressure changes which occurred and the angioscotoma; (4) there is a marked variation in the extent and rate of widening of the angioscotoma, not only between individuals, but also to a lesser degree in one eye as compared to the other eye of the same individual.

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THE EVALUATION OF ORTHOPTIC TRAINING FOR AVIATORS

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Generally speaking, for the past several years one of the most common physical defects in Air Corps officers as well as in other flyers which requires either a waiver or actual cessation of active pilot duty is in some way or other associated with the eyes. Hitherto, except for improving general physical fitness by the usual hygienic measures, which affects the tonus and coördination of the intra- and extraocular muscles precisely like that throughout the rest of the body, nothing further could be done. Rest from excessive reading, improvement of lighting, and similar suggestions were always recommended where applicable.

It has been felt by many flight surgeons that specific means to correct defects in depth perception as well as excessive phorias should be developed and used in addition to the general measures employed, as mentioned above. The practice of requiring waivers for ocular defects in experienced pilots on the theory that experience compensates for the defect has been the only course open to the flight surgeon. It is considered that this procedure was more justifiable when the flight surgeon was enabled to fly with his pilots and make first-hand observations than it is at the present time. In any case, it is considered far more feasible to correct the defect when possible and thus eliminate the necessity for waivers in some cases and their postponement in others. The fact that the flight surgeon is attempting to remedy a defect hitherto practically untreated has a beneficial psychological effect and tends further to strengthen the bond between the pilot and his flight surgeon.

In an effort to test the effectiveness of the orthoptic equipment commercially available along the above-mentioned lines, the following study was made of personnel on duty at this station. The Wottring Rotoscope, the Keystone Tel-Eye-Trainer and Stereoscope, with the different sets of slides, and the American Optical Master Model Stereo-Orthopter were used. The technique was that taught by the representatives of the manufacturers of the various instruments, who generously devoted considerable time during the earlier phases of the work.

Those officers who had excessive phorias, as judged by Army Regulations 40-110; who had deficient depth perception; who were border-line cases, and in whom a study of previous examinations revealed a progression toward one of the limits as set forth in the above-mentioned

regulations, were used as subjects. It is especially to be noted that this group does not represent a cross section of the average ophthalmologist's practice. These individuals were above the average in physical development, and the defects studied were, in general, mild as compared with those usually observed or treated by ophthalmologists. It is thought, however, that most of the sorts of disorders encountered were similar to many states generally overlooked or not treated due to lack of equipment or appreciation of their importance.

Evidently no study has been made on a group of aviators such as these with a view to determining just what could be accomplished by the use of orthoptic equipment. The author had no preconceived ideas, although it was understood that many recognized ophthalmologists believed the results reported to be questionable as to worth and duration and of little practical value.

Subjective symptoms were comparatively uncommon and received very little attention because it was thought that subjective sensations were too unreliable and variable properly to evaluate the results of this type of experimental work. Most of the officers insisted that their eyes felt "stronger" after the training was completed even though no definite asthenopic symptoms were noted at any time. So many factors have a bearing on this finding that its true significance is questionable. The measurement of the results, when using as nearly as possible objective tests, was considered before any work was undertaken.

The ophthalmological equipment already at hand served as a part of the means for the measurement of results. The usual ophthalmological equipment with which these men are regularly examined semi-annually by the flight surgeon was used. This includes the standard visual-test cabinet, the phorometer, the modified Howard-Dolman depth-perception apparatus, and the Prince rule for determining maximum accommodative power. Other tests, such as the determination of the maximum angle of convergence and ophthalmoscopic examination were also regularly made. In addition, the Keystone stereoscope, with the various sets of slides, was used to check stereopsis. It was also felt that routine determination of the extent of the binocular field with subsequent recheck would be indespensable in evaluating the results.

A device, easily constructed, designed by the author in an attempt to modify the standard large-sized perimeter, greatly simplified and shortened the time necessary for the determination of the binocular field (fig. 1). By use of this method, highly accurate and consistent determinations of the binocular field were made in very little more time than was required accurately to determine the perimetric field of one eye. The method of obtaining binocular fields was described in a previous paper in which a statistical norm of the binocular field for a group of flying cadets was established. The zero point referred to in the following description was considered as a hypothetical line drawn parallel to half way between the normal visual axes with the eyes in the neutral positions.

It has become more apparent that the extent of the binocular field, when determined with reasonable accuracy, offers the best and most practical test available of the total efficiency of the extraocular neuromuscular system. Binocular field studies deserve far more attention than they have heretofore received by flight surgeons as well as by the practicing ophthalmologist. They will often disclose

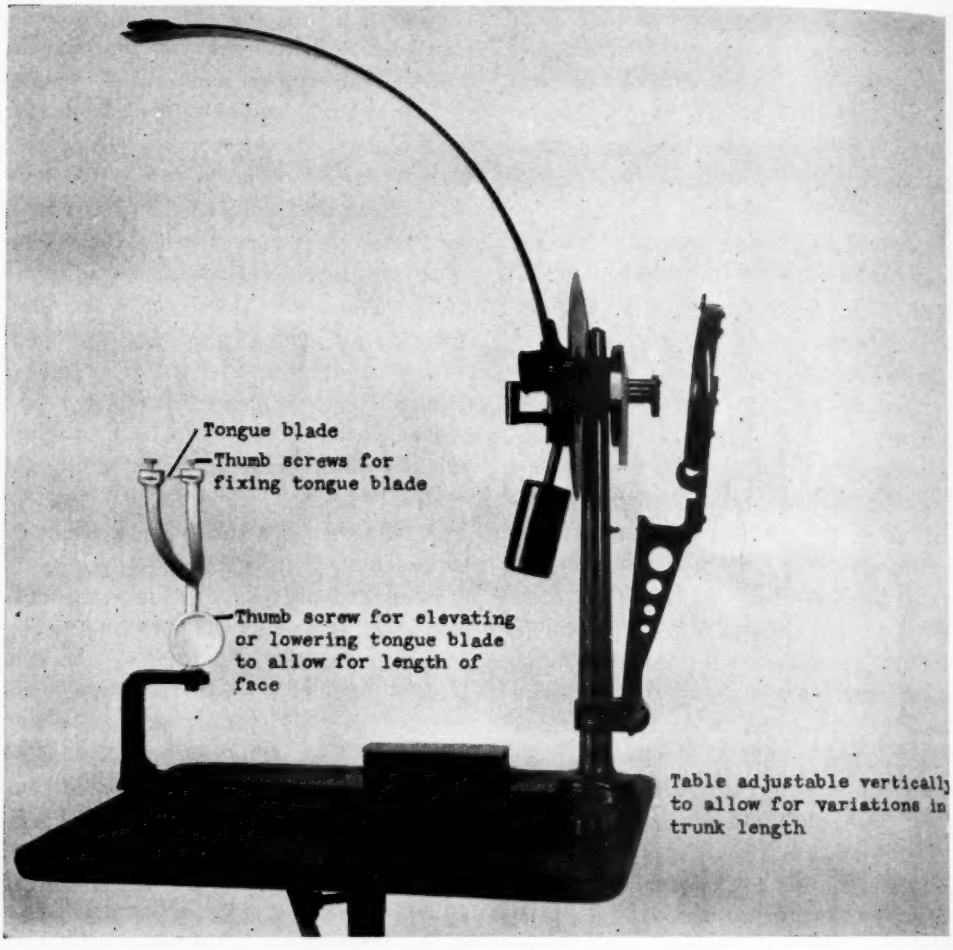
Tongue blade
Thumb screws for fixing tongue blade
Thumb screw for elevating or lowering tongue blade to allow for length of face
Table adjustable vertically to allow for variations in trunk length

Fig. 1 (Schwichtenberg). Standard perimeter with modification for taking binocular fields. In this head support the tongue blade is held between the upper and lower teeth with the anterior incisor teeth even with the front edge of the blade. The use of the tongue blade has many obvious advantages. For making determinations of the binocular field, the head is properly fixed by the individual biting the tongue blade, which is adjusted so that the zero point is on a level with the eyes. A small thin red glass is held on a handle in front of either eye. A small ophthalmoscope light is used as the object of fixation of both eyes and it is moved radially until the examinee reports the light to change from a pink to red or white, or its separation into a red and white light. The light is then moved inward until binocular fixation is regained, at which point the light changes to pink. The limit of binocular field is checked objectively because the reflection of the light from the cornea on the nonfixating eye begins to assume irregular movements at the limit of the binocular field of vision. The automatic recording device is not used.

surprising facts about the binocular vision in patients whose glasses fail to give the relief expected or in those with marked asthenopia whose refractive error is not sufficient to account for the discomfort.

It was noted that often gross defects existed in the binocular fields that were undetected by the rough methods generally used. While these defects were found very rarely in individuals who satisfactorily passed the eye examinations prescribed by the Army Regulations, they were found to be very common in indi-

viduals with excessive phorias or in borderline cases. They were also very common in individuals with defective depth perception and with any marked deviation from the normal limits (AR 40-110) of the angle of convergence or prism divergence.

It was found just as important to plot the point at which fusion was regained as simply to plot the limit of the binocular field in any meridian. For example, many instances were noted in which the test light was moved back along the meridian almost to the zero position before binocular vision was reëstablished. This is of tremendous practical importance in flying efficiency and safety. It indicates that little fusional reserve exists, and that actual diplopia or monocular vision with monocular or alternating suppression will usually occur with general fatigue, anoxemia, and mild toxic or febrile states. Staleness seems to be associated with gross defects in the binocular field and the rapid onset of mild extraocular-muscle incoördination with diplopia or suppression. A number of instances were noted in which the extent of the binocular field could not be fully determined at first because of the rapid onset of fatigue and the development of diplopia in the primary position. This, of course, gives rise to a spiral-shaped curve rapidly approaching the zero position. It is considered extremely important that the monocular vision, with suppression or diplopia so induced, was found to persist for as long as several hours, although generally binocular vision was recovered within five or ten minutes. This condition appears to be the most amenable to coordination exercises with orthoptic instruments, and in none of the cases studied has there been a failure in prompt and rapid improvement. As intimated above, the fatigue factor is tremendously important, and the impression has been gained during this study that it is likely to play an important part in any future study of fatigue. It is believed that this fatigue accounts for the considerable variation in eye findings noted in aviators.

Perhaps the most constant finding in this study was the extension of the binocular field approaching the theoretical limits set by the presence of nose, cheek, and eyebrows. The binocular field of vision of the average individual does not extend to this limit even though textbooks often give this impression.

Thirty officers from this field and nearby Air Corps installations were selected for the experiment because of the presence of defects previously described. Of these, 12 were observers and the rest pilots. The more marked defects were all found in the observer group, which is as was to be expected. The single defect most commonly noted in this group was defective depth perception, and following in the order of frequency were excessive exophoria, excessive hyperphoria, excessive esophoria, insufficient prism divergence, primary diplopia, and deficient angle of convergence. The numbers of each, including other pertinent information, are tabulated in the following table.

The improvement was excellent in the great majority of cases studied, as is indicated in the third column of the chart. The two individuals showing no improvement in depth perception were those with primary diplopia, which is still uncorrected. One of these had received extensive damage to the bony structure around the left orbit with considerable disturbance to normal anatomical relationships. Here plastic repair is indicated, although for other reasons it does not seem feasible. There was a marked extension of the small original range of binocular vision in the lower quadrant, however,

TABLE I

ANALYSIS OF DEFECTS AND RESULTS

Defect	Total	Number in which no other defects were noted	Improved to within acceptable limits
Defective depth perception	11	3	9
Excessive exophoria	10	5	9
Excessive hyperphoria	7	0	4
Excessive esophoria	3	0	3
Insufficient prism divergence	3	1	3
Primary diplopia	3	0	1
Deficient angle of convergence	2	0	2

Total number of officers: 30.

which was of much practical value to the individual concerned, and the downward and lateral deviation of the left eye largely disappeared. The second individual took but two or three muscle-coördination exercises. This is admittedly insufficient to base any judgment as to the efficiency of these instruments, yet it is considered as a failure. In the other cases, the improvement in depth perception has remained essentially unchanged during a six-month period following the return to normal. The average number of treatments was about fifteen.

Neither the rotoscope nor the stereo-orthopter made any appreciable difference in the depth perception of individuals in this experiment. It was noted many times that an individual with heterophoria, in addition to defective depth perception, returned to normal as to the former, but the latter remained essentially unchanged beyond the known day-to-day range of variation. Here the Keystone View Company's stereometric slides, used for training as well as for checking stereopsis, proved highly efficient and are now used almost exclusively for this purpose.

In the use of these slides, a number of interesting observations on the degree of correlation between the scores attained on them and the results obtained with the standard Howard-Dolman depth-perception apparatus were made. In well over a hundred tests with Keystone stereometric slides, the results closely followed the well-known curve of averages. The peak of the curve fell at approximately 45 percent. The lower end of the curve did not come to the base line because the few individuals mentioned above failed in the test altogether. The consistency of the test was found to be great because individuals who did not receive coördination exercises when tested about a month apart showed very close to the same score each time. This was done in only a few cases here as the results were quite uniform in all instances.

A few words describing the stereometric slides seems essential at this point for a better understanding of that which is to follow. The information was kindly furnished the author by the Keystone View Company and is essentially as follows: Three rows of various-sized letters were placed on strips of white screen at a distance of three meters from the lenses of the stereoscopic camera. One letter or figure in each row was brought forward toward the lenses of the camera a predetermined distance, ranging from 813 mm. in slide number 1, which gives a binocular angle of 1300 seconds of arc, to but 4 mm. distance in slide 23 with a binocular angle of 10 seconds of arc. They state that this was used because it was discovered that on stereoscopic slides a stereopsis or binocular angle of more than 1300 seconds was usually perceived by a subject with binocular vision but

without other evidence of stereopsis because the letter or figure appears to be doubled at that point. An individual who fails to recognize a binocular or stereoscopic angle of 1300 seconds may be said to have no stereopsis. In establishing the percentage of stereopsis in 5-percent steps from 110 percent down to the threshold of stereopsis, a curve was followed similar to that formed in determining the percentage of visual efficiency according to the minimum visual angle. This is, of course, empirical but entirely practical. Slide number 21, for example, is designated 100 percent stereoscopic, and in this instance the distance of the letters from the screen is 10 mm., giving a stereoscopic or binocular angle of 19 seconds.

All flight surgeons are familiar with the theoretical basis of the Howard-Dolman apparatus. With 64-mm. interpupillary distance and with the stationary rod located 6 meters from the eyes and a depth difference of 25 mm. between this and the adjustable rod, there is subtended a binocular angle of 9.119 seconds. This is also an arbitrary standard and was chosen because it was demonstrated during the war that individuals who persistently projected the adjustable rod more than 25 mm. from the zero point almost always failed to make satisfactory progress in their flying training.

Judging from the theoretical considerations above enumerated, individuals who are able to pass the standard Howard-Dolman test should be able with equal ease to pass the last slide or 110 percent in the stereometric group which has a binocular angle of 10.4 seconds against 9.119 seconds. Yet, this is far from the actual experience with the Air Corps officers studied here. It was found that less than one subject in ten who could attain a score of 30 percent to 35 percent on the stereometric slides, failed to pass the Howard-Dolman test. Further, in no instance studied here, when an officer attained a grade of 85 percent on the stereometric slides, did he fail to set the pegs in the Howard-Dolman test consistently within a 5-mm. range of zero. Only one officer attained a score of 100 percent and none were able to exceed that point. In spite of all this, there actually was otherwise a high degree of correlation between the two tests. Individuals who fell below a score of 20 percent usually failed on the Howard-Dolman test. Those who made a better score on the stereometric slides were correspondingly better on the Howard-Dolman test. In discrepancies, it was found on retrial that in almost all instances the stereometric ratings were more accurate and consistent.

The explanation of the actual differences noted must be largely a matter of opinion. The factor of pure chance plays far too great a rôle in the Howard-Dolman test. All flight surgeons have noted that individuals with either no or markedly impaired depth perception will frequently happen to set the pegs near the zero point. The spread of 25 mm. on either side of the zero point, making a total of 50-mm. range within acceptable limits, is also an important factor. In the stereometric test, the total spread is equivalent to 30 mm. at 6 meters, and all readings are on the same side of the zero plane of the background letters. In the Howard-Dolman test, apparent changes in the size of the pegs aids in the estimation. One reason that the stereometric slides were considered more accurate was that three readings must be made at each 5-percent increment. This reduces the chance factor almost to zero. The factor of changing relative size that has no part to play in true binocular depth perception

is eliminated, since both the letters that stand out as well as those in the background plane vary in size. Many men estimate the Howard-Dolman test by making gross comparisons and then splitting the difference. In the stereometric slides this as well as memory is utterly out of the question. Another point was the high correlation shown between the two tests when the individuals with defective depth perception were given the odd-numbered slides for the exercises. Checking the improvement from time to time by comparing the even numbered slides with the Howard-Dolman test gave consistent findings.

Ten subjects, or 33 percent of the group, had exophoria of 2 diopters or more at 6 meters or more than 12 diopters at 33 centimeters. All but one case of exophoria promptly returned to orthophoria. In two cases one or two diopters of esophoria at 6 meters developed within much less time than estimated. It was found that exophoria cases required closer supervision than the others because of the rapid shift in the neuromuscular equilibrium that sometimes occurred. These cases, once returned to orthophoria, have remained essentially unchanged for from six to eighth months. The individual that remained essentially unchanged during more than two months' treatment, so far as the exophoria was concerned, developed an abnormally high maximum angle of convergence and was able to fuse objects of 45 prism diopters of esophoria at 6 meters, also at 33 centimeters. The binocular field of vision extended to practically its theoretical limits. It has so far not been determined why this officer failed to develop a new equilibrium nearer orthophoria in view of his relatively great reserve convergence. The average number of treatments was eighteen. Most of the exercises were taken daily and lasted from three to twenty minutes. Symptoms of asthenopia as a result of treatment were very mild or absent. Nearly all uncomplicated cases of exophoria will respond to orthoptic training provided there is some fusion that can be developed. The rotoscope and the master model stereo-orthopter produced the most rapid improvement, especially the former. The Keystone equipment was equally effective but required more time. Its advantages are that less of the doctor's time is required and over correction is less likely.

Judging from this experiment, hyperphoria is far more difficult to correct than any other eye-muscle imbalance. This has been noted by many opthalmologists. Two of the three failures noted were in the same individuals who had primary diplopia and also failed to improve in depth perception. In one of these cases, twelve diopters of right hyperphoria was reduced to between six and seven diopters, but it is doubtful if this much hyperphoria will be correctable without plastic repair. The other two are very slowly improving. Deficient fusion with primary diplopia, but recently improved in one instance to the point where it is only present with fatigue, probably accounts for the failure so far. These cases are considered as failures at present.

Several writers comment upon the inability of coördination exercises to correct hyperphoria. It is believed that the better than 50-percent success attained here is due to the fact that anything over one-half prism diopter was treated. In all cases, changes in hyperphoria were many times slower than in any other heterophoria. This was shown when the hyperphoria was complicated by the presence of other heterphorias. The latter were corrected to normal limits much sooner than the former.

The use of Keystone slides or manipulation of the slides to correct hyperphoria did not result in nearly so rapid improvement as could be attained by either the rotoscope or the stereo-orthopter. This was more evident the greater the degree of hyperphoria. It is believed that the difference between the stereo-orthopter and the rotoscope, in so far as the correction of hyperphoria is concerned, is a matter of personal preference. In the former, the muscle-coördination exercises are on the horizontal plane, and in the latter there is a circular motion. It is apparent that a circular motion causes greater activity on the part of all the extraocular muscles, yet most of the ocular movements are small and more or less jerky mainly in or near the horizontal plane within about 10 degrees of the neutral position. It is generally accepted as a fact that no ocular movements occur without some degree of actual stimulation or active relaxation of all of the extraocular muscles. Thus, even movements on the horizontal plane stimulate and coordinate all the extraocular muscles just as in circular movements, but, it is thought, to a smaller degree. Be this as it may, it is believed that, in cases of hyperphoria with fairly good fusion, uncomplicated by pathology in the orbits, well over 60 percent can be corrected in time. The failures will usually occur with increasing numbers if more than about 1.5 diopters exists, unless there is a good fusion sense or at least one that can be stimulated and developed. It is rare, however, to find hyperphoria of more than 1.5 diopters in Air Corps officers.

Excessive esophoria was found in three cases or 10 percent of this group, and in all instances was associated with other eye defects. Esophoria of more than 4 diopters at 6 meters or more than 2 diopters at 33 centimeters was considered excessive. Orthoptic training in these instances uniformly produced rather marked and troublesome asthenopic symptoms if carried on for more than two or three minutes at first. Due to these symptoms, it required constant urging to carry on a study of this group. Fortunately, the asthenopia soon diminished, but even slightly excessive training, after some time, caused a partial return of the symptoms which lasted several hours. Two of these cases were of the so-called innervational type and the third of the so-called accommodative type. All responded well to the coördination training. All wore proper corrections even during the training. The average number of treatments was approximately eighteen. It is worthy of note that, in those two individuals treated for exophoria in which esophoria of 2 diopters at 6 meters developed in a surprisingly short time, only from four to six periods of training were sufficient to restore essentially consistent orthophoria. None of the cases studied had more than three or four diopters of esophoria, which may have accounted in part for the good results.

In regard to the instruments used, it was found that all were effective, although the Keystone equipment was considerably slower in effecting the same result than the other two in the study. It must be remembered, however, that too few cases of this type were treated in the group to make the above statement absolute. Other individuals not included in this series responded similarly.

In regard to prism divergence, all officers having less than 4 prism diopters or more than 15 diopters at 6 meters as well as those having in excess of 9 diopters associated with an angle of convergence of 50 degrees were considered outside the range of normal and were given muscle-coördination exercises. All of the

cases in this series happened to have insufficient prism divergence of less than 4 diopters. All responded well to coördination training; and in this group a number of vague asthenopic sensations were very common but all were relieved. Insufficient prism divergence was unassociated with other eye defects in only one instance. Other individuals, not in this series, responded similarly. About 18 treatments were the average for this group, but this is high because of other associated defects which were slower to return to normal. An average of 10 to 12 periods should suffice, if the condition is unassociated with other defects. All of the instruments used in this study produced good results although the Keystone equipment was somewhat slower.

Three cases of primary diplopia were found in this group. One, already discussed, due to excessive hyperphoria failed to develop fusion in the neutral position but had good fusion in the lower part of the normal binocular field, which was markedly extended during the coordination exercises. Approximately 90 treatments spread over several months were required. Another individual took too few exercises. It is thought that to class these as failures is probably unjust to the evaluation of this equipment in some respects, yet, after all, they are failures. In several other cases, not in this series, with actual tropia, extremely satisfactory results were obtainable, but these were the results of months of daily exercises requiring a good deal of patience on the part of the patient as well as of the physician. The individual with diplopia which responded well required over thirty periods of exercise. Cases of primary diplopia will, of course, very rarely be found in Air Corps officers, and tropias never except following crashes, with injury to orbit or neurological tissue.

Two cases of deficient angle of convergence were encountered. These responded rapidly to coördination exercise, requiring only eight to ten periods. All have remained essentially the same over a six-month period. Almost all cases of uncomplicated deficient angle of convergence will respond with great rapidity and ease to coördination exercise in the experience of the above as well as in other cases not enumerated in this series.

A curious finding, improvement in visual acuity during the course of the coordination exercises was noted in the majority of the officers used for this experiment. For example, an individual with 20/30 vision would later develop 20/20 vision or one with 20/40 vision would develop 20/30 vision, and so on. The officers were all sure that there actually had been improvement and several readings made it unlikely that this was an experimental error. Such a finding is difficult to explain but may be the result of more perfect coördination rendering more exact adjustment of the eyes possible, so that the two fovea are brought to the position of greatest efficiency. No intraocular change as a result of this experiment was observed.

Another observation was that the inability in some officers to fuse accurately two half circles, due to overlapping at the top or bottom which required rotation of the cards, was largely corrected. This was considered to be slight torsional imbalance. Torsion is not gone into as a part of the regular ocular examination of Air Corps officers. It may be of great but unrecognized importance, although it is thought that eyes within the acceptable limits for flying-cadet appointment are not apt to have torsion to any significant degree.

It is not, of course, reasonable to draw too iron-clad conclusions from the above

study. This is due to the comparatively small number of cases studied, which allows for inevitable statistical error. They were very carefully followed, and in view of the almost ultracritical manner in which the results were measured, a larger series would probably not deviate much from the above study. As a matter of fact, it is considered highly probable that a larger series might show a still more favorable result. One or two instances were included in this study in which return to normal could not have been expected by even the most optimistic. Criticism on this point may be justified. In spite of this, however, it is felt that orthoptic training will eventually come to be a standard procedure in industries, especially in aviation where nearly perfect eyesight and neuromuscular coördination is highly to be desired. The high percentage of individuals showing improvement more than justifies its use.

In the aviation industry, especially among the pilot group, are found the most ideal circumstances for the use of this equipment. The defects encountered in the Air Corps officers are not as a rule excessive because great care is taken in their selection prior to acceptance as flying cadets. This group is vitally interested in maintaining their physical efficiency at the highest point and perfect coöperation is almost assured. There is no doubt that the usefulness of this group can be prolonged, because the necessity for waivers due to eye defects can be diminished or postponed. It is considered feasible to improve and maintain the coördination of the neuromuscular system of both eyes at its greatest efficiency rather than carry on with many minor disturbances which may become of major importance with fatigue or anoxemia. The value to the service of continuing useful pilot life in one aviator for one year more than covers the cost of this equipment; it is therefore an economical procedure. It is important that the number of candidates that pass the qualifications for flying-cadet appointments can be materially increased, if necessary, by giving orthoptic training to those who are satisfactory except for eye-muscle imbalance, defective depth perception, or other defects shown to be correctable in a reasonably high percentage of individuals treated. This is especially important in war time, and provision for this type of work may well be made in that eventuality. In examining the records, it was found that for flying-cadet appointments, 8½ percent of 1334 applicants examined here failed only because of what must now be considered to a large extent correctable eye defects.

The use of orthoptic equipment for purely diagnostic purposes offers a field of research in aviation medicine that has hardly been touched. The Keystone stereometric series is thought to be a far more accurate test for depth perception than that used at present and requires far less room. The use of mirrors and the proper test letters or the projecto chart enables the ordinary-sized room to be used as a dark room, which is very important in view of the additional expense of construction of the usual 25-foot dark room in Army Hospitals and Dispensaries. The Keystone visual-acuity slides offer a valuable check against the Snellen test generally used. A high degree of correlation existed between the two means of measuring visual acuity in the group of officers studied. The Keystone View Company has kindly consented to make a new group of slides, which will be reported upon at a later date, with the object of making fractional reading possible, as is done at present in the Snellen test charts. The phoria and other fusion tests should be studied further with a view to

evaluation and possible adoption as a standard method of examination. Experience here indicates that the accuracy is comparable to that using the phorometer. A problem that will be studied here shortly is the development and evaluation of a dynamic test for phorias as distinct from the present more or less static test using the phorometer with the eyes in the neutral position. The Wottring rotoscope and, to a slightly less extent, the American Optical master model stereo-orthopter are especially adaptable to the development of such a test. They have the enormous advantage of being purely objective instead of subjective tests for phorias and the range of fusion. The onset of jerky movements of the eyes indicates that the limit of fusion is reached or exceeded in this test. It is not possible to falsify this type of test by various means for which all flight surgeons must constantly be on the alert.

Commander C. J. Roberts of the Navy has made a study of fatigue as it affects the adjustment of the eye to near and far vision and has found that it has a marked bearing on the speed of adjustment in all ages, especially as age increases. The age factor was found to be especially important after about thirty years. He recommends that pilots not within the limits of safety be disqualified until they can make normal adjustments. It is felt that this as well as depth perception is largely a cerebral cortical and subcortical process and may be interpreted as being a good indicator of the state of this important part of the body. It being the most highly specialized would reasonably be expected to show first the effect of fatigue, toxema, or anoxemia. It is thought that tests like the above, together with the range of fusion or other tests of the integrative actions of the neuromuscular systems of the eyes may well prove to be far more reliable indexes as to the state of well-being of the body than any now available.

In summary the following points seem important:

1. That in aviators defective depth perception, heterophorias, deficient angle of convergence, and deficient prism divergence are largely but not invariably correctable by the intelligent use of orthoptic equipment commercially available.

2. That aviators constitute an ideal group for the correction of the aforementioned defects because of their vital interest. The correction of these defects is considered entirely feasible as well as an economical procedure.

3. That fatigue, which is easily measurable, has a marked effect on the integrated activities of the eye muscles, and subsequent study may bring out more reliable indexes of fatigue than are available at present.

4. That orthoptic equipment offers great possibilities from the standpoint of developing new tests for the measurement of the eye functions and the simplification of present tests.

Wright Field.

INFLAMMATORY PSEUDOTUMOR OF THE ORBIT*

Report of a case

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Inflammatory pseudotumors of the orbit are not extremely rare, yet few cases are reported. When in 1923 Benedict and Knight published their paper, they could find reports of only five cases in the literature since the publication of Birch-Hirschfeld's review in 1910. As was stated by these authors, the condition is certainly more common than this paucity of reports would indicate. Undoubtedly many cases are not reported, due to errors of diagnosis and their radical removal by exenteration of the orbit. It is, therefore, impossible to estimate the true incidence of this peculiar condition.

In addition to the seven references to pseudotumors by Benedict and Knight and 10 others listed by Reese, 13 other authors who have reported one or more cases were found in the literature. My chief reason for presenting the following case is not because of the rarity of the condition, but to call attention to the liability of obtaining an erroneous report of malignancy. Most general pathologists are unfamiliar with this type of orbital growth, and are therefore likely to advise an unnecessary orbital exenteration.

As the symptoms and signs of these inflammatory tumors have been fully described by other authors, it is unnecessary to repeat them here. It is sufficient to say that they so closely resemble those of other orbital tumors, either benign or malignant, that they are frequently not diagnosed until a microscopic examination has been made, and even then the pathologist's report may be erroneous. It is often absolutely impossible to make the differentiation clinically. This fact has been stressed by many writers on the subject. In 30 cases analyzed by Reese, 15, or 50 percent, had exenterations of the orbit performed for suspected malignancy. The possibility that an orbital growth may be a mass of chronic inflammatory tissue rather than a true tumor should always be kept in mind. This applies especially if: (1) the patient is middle-aged; (2) he gives a history of rather sudden onset; and (3) X-ray pictures show that no changes in the bony walls of the orbit have taken place.

The etiology of these tumors is unknown. Various theories have been advanced, the most common of which are that the growths are due to: (1) very late syphilis; (2) tuberculosis; (3) trauma with recurrent orbital hemorrhages; (4) various foci of infection. None of these theories has been entirely substantiated. It is most likely that these inflammatory masses arise from several different causes.

The treatment of these tumors has been adequately described by other writers. The most important and most difficult factor is the making of a correct preoperative diagnosis. Several authors, as, for example, de Schweinitz, T. Colley, and others, have reported good results from large doses of iodids and mercurials. La Rocca reported the case of a diabetic in whom treatment by proper diet and insulin resulted in a complete cure within five months time. Meller states that X-ray treatment may give good results. Hayes Martin discourages the use of radiation because he found that the majority of

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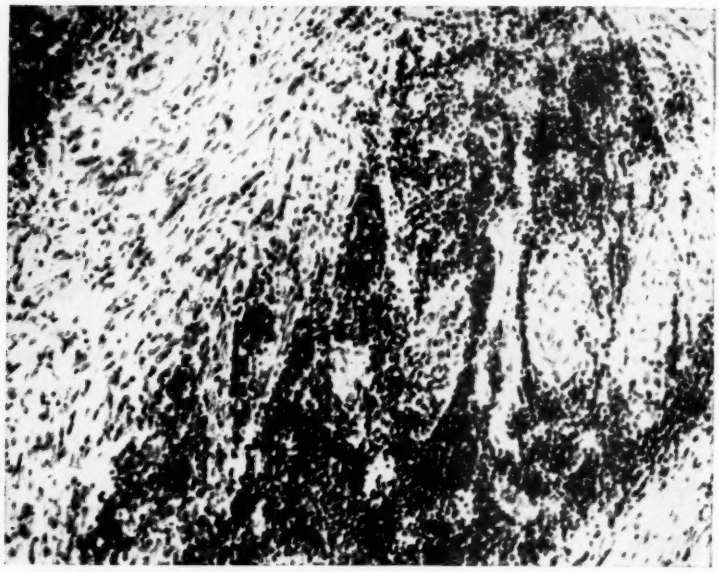

Fig. 1 (Lewis). Chronic inflammatory tissue from an orbital pseudotumor (×200).

these cases fail to respond, and that damage to the eye may occur. In doubtful cases—as many of these are—the best procedure is to resort to biopsy. Sufficient tissue should be removed for careful microscopic study. If it definitely proves to be chronic inflammatory tissue, large doses of iodids and mercury should be

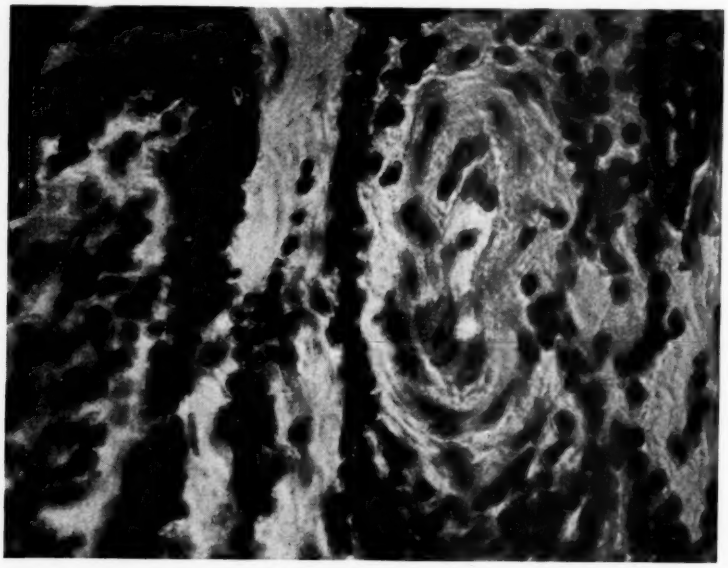

Fig. 2 (Lewis). Fibrous-tissue bundles with numerous dense collections of small lymphocytes. On the right side is seen an arteriole showing obliterative changes. Numerous fibroblasts and a few plasma cells are seen (×735).

given, and the patient should be assured that he will eventually recover.

The following is the report of a case seen and treated by me in July, 1934:

The patient was a colored man, aged 40 years. He complained that his left eyeball was enlarging and was occasionally painful. The protrusion was first noticed one month previously. Since that time the eye had become much more prominent. He did not complain of poor vision, but on being questioned stated that his sight had failed somewhat since his eyeball began to enlarge. There was no history of a blow or other injury to the orbit. A complete general physical examination was negative. The blood Wassermann and Kahn tests were negative, there was no history suggesting syphilitic infection, and he denied ever having taken antisyphilitic treatment. X-ray pictures of the nasal accessory sinuses showed all to be moderately cloudy, but clinical examination showed no pathologic condition.

The exophthalmos measured 9 mm. Slight displacement of the eyeball upward and inward was noticed, but diplopia was not complained of. Motion of the eyeball upward and inward was fairly normal, but outward and especially downward there was marked limitation of movement. A definite, firm mass could be palpated between the eyeball and the floor of the orbit. Vision in the right eye was 6/6 and in the left eye, 6/60. Except for the proptosis and limitation of motion, the eye appeared normal externally.

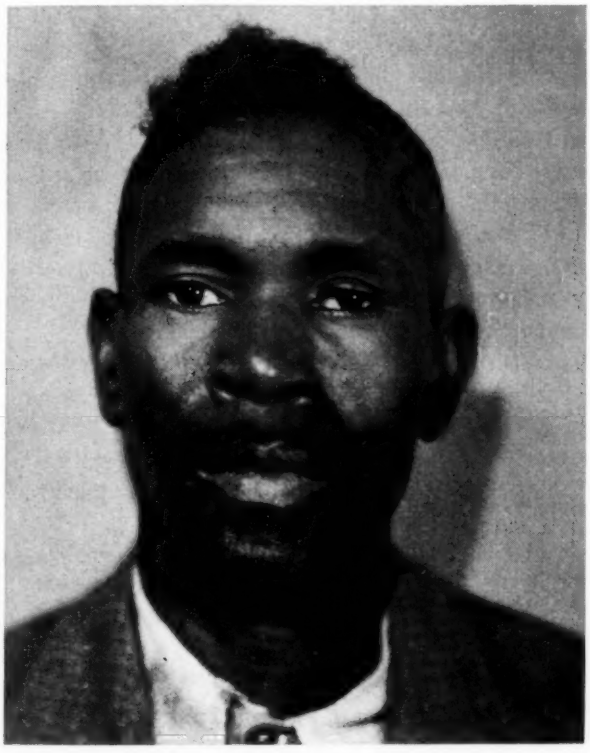

Fig. 3 (Lewis). Patient four months after operation, showing enophthalmos.

The media were clear and the fundus was normal. X-ray examination disclosed no changes in the bony walls of the orbit.

Operation was done under ether anesthesia. First a canthotomy was performed, and the external canthal ligament was divided. From this point downward the conjunctiva was divided along the fornix all the way to the inner canthus. The anterior tip of the tumor was then easily exposed. Palpation showed that the growth extended far back—practically to the apex of the orbit. It lay outside of the cone of muscles along the entire orbital floor. Temporally it extended upward to the level of the lower border of the lateral-rectus muscle. By blunt dissection the mass was gradually freed from its attachments to the surrounding orbital structures and removed. Hemorrhage was not excessive and was easily controlled. The conjunctival incision and the canthotomy wound were closed with silk sutures.

Description of specimen

Macroscopic. The tumor was quite large, measuring 9 mm. thick, 17 mm. transversely, and 22 mm. anteroposteriorly. The surface was roughly irregular, and in consistency was firm and resilient or rubbery. On section it was white in color with small islands of yellow.

Microscopic. Dr. M. Pinson Neal, who at that time was acting professor of pathology at the University of Tennessee, examined the slides made from the specimen. After examining a frozen section he reported that the growth was malignant. After a more thorough examination he reported as follows: "The tissue shows essentially a low-grade, chronic inflammatory reaction with many fibroblasts and a very heavy fibrillar deposit. Throughout this general background there is an infiltration of lymphocytes and in places there are definite lymphoid follicles. In the center of some of these the vascular channels are dilated and the lumen filled with endothelial cells, some of which are in mitosis." Owing to the doubt expressed by Dr. Neal and other local pathologists as to the exact character of the tumor, bits of the tissue and some of the slides were sent to Dr. A. C. Broders, of the pathology department of the Mayo Clinic, and to the Registry of Ophthalmic Pathology at the Army Medical Museum, Washington, D.C. The essential portion of Dr. Broders's report is as follows: "While the lesion is very inflammatory, nevertheless I am of the opinion that it also shows a highly malignant neoplasm, probably a grade 4 carcinoma of the adeno type, which is to a large extent veiled by the inflammation." The tissue sent to the Army Medical Museum was examined by Major V. H. Cornell and Lieutenant Colonel George R. Calender, who reported that it was an inflammatory pseudotumor of the orbit. Their description was essentially the same as that of Dr. Neal and it is, therefore, omitted.

Subsequent Course. The patient made a rapid recovery. The exophthalmos disappeared completely, but was replaced by a moderate degree of enophthalmos. Vision improved rapidly to normal. Motion of the eyeball downward and outward remained markedly limited. There was never any complaint of diplopia. The patient was last seen about two years after the operation. He was instructed to report at once if he noticed any protrusion of the eyeball, but he has not been heard from. The complete recovery substantiates the opinion that the growth was not malignant.

Summary

1. The frequency of inflammatory pseudotumors of the orbit and the diffi-

culties encountered in their differential diagnosis are discussed.

2. A case with satisfactory operative removal of a large tumor is reported, with photomicrographs of the tissue.

3. The divergent views of many highly competent pathologists are given to illustrate the ease with which an erroneous diagnosis may be made, thereby misleading the clinician and causing serious damage to the patient.

Exchange Building.

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Discussion

Dr. F. H. Verhoeff, Boston: I have been interested in these pseudotumors for many years, and now have a great many sections of these growths accumulated during at least 20 years. The reason I have not described these cases at length is because I have been hoping that I would discover the cause of the condition, but I never have. However, I have ascertained that the tumors have a very definite histology. The characteristic histologic feature was described by the essayist in his report. He spoke about the lymph follicles and the changes in the blood vessels within them, features that I have found characteristic of this condition. There is a lymph follicle much like any other lymph follicle, but the blood vessels proliferate in it forming irregular masses of endothelial cells. Evidently this process represents abortive attempts to form capillaries within the follicle. I described this in Penfield's "Cytology of the nervous system" in connection with the subject of tumors of the optic nerve. Parsons, many years ago, reported what he regarded as an endothelioma of the optic nerve, but I am sure that the growth was really one of these pseudotumors which had surrounded the optic nerve. I have found that some of these pseudotumors have responded to potassium iodide treatment. Some have been very sensitive to this drug, so that we had to give extremely small doses. Some tumors that did not respond to potassium iodide did respond to X-ray treatment.

Dr. C. A. Clapp, Baltimore: In discussing this paper I wish to report a case that is almost identical in history and appearance. It occurred in a man of about 40 who first noticed beginning proptosis in July, 1936. I first saw him in September, 1936, at which time he had 4 mm. of proptosis with very limited motion, but with normal fields. The proptosis increased, however, and even in the presence of a negative Wassermann he was placed on both mercury and potassium iodide without result. He was also given radiation treatment, which was likewise without result. The proptosis increased until it measured 8 mm. and hemorrhages began to appear in the fundus. As consultants agreed with my opinion that an orbital growth was present, and in view of the severe pain,

dissection was made above, and the tumor or pseudotumor was found to extend clear to the optic foramen. A frozen section was made, which was reported as "suspected malignancy." The tumor or growth, including the apex of the muscle cone, was removed. The photomicrograph of the tissue is very similar to that of Dr. Lewis's case. There has been considerable discussion as to the diagnosis. Dr. Rich, of the Pathological Department, is of the opinion that it is an inflammatory growth, and Dr. Friedenwald believes that it is syphilitic in character. In view, however, of the repeated negative Wassermann tests and since the patient showed no improvement on antiluetic treatment, I doubt very much, at least from the clinical aspect, whether this growth was of syphilitic origin.

Dr. Hans Barkan, San Francisco: I think that I probably do not occupy an isolated position here when I say that we have found the diagnosis and the treatment of unilateral exophthalmos one of the most difficult clinical problems in our experience at the Stanford Hospital. Birch-Hirschfeld clinically divided the cases very well: The first group, in which one does not operate, is either cured by potassium iodide, mercury, a mixture of them, X ray, or requires no treatment at all because the tumor disappears. It leaves spontaneously; one never knows what caused the proptosis nor why it disappears; perhaps it does as a result of treatment. The second group is that in which we operate and find no tumor; the third group is that in which we operate and find some form of growth, probably that described by Dr. Verhoeff. I would point out that in several cases Dr. Naffziger has shown the proptosis to be due to a myositis of the ocular muscles. Unilateral proptosis can occur also in cases of exophthalmic goiter. This may occasionally be the case when we operate and do not find a tumor. We have seen several unilateral cases in young girls, preceding the development of an exophthalmic-goiter syndrome by about one-and-one-half years, without change in the metabolic rate, so that the possibility of an exophthalmic goiter occurring under those conditions must not be overlooked. Lastly, we have seen one case of a metastatic retrobulbar carcinoma originating in the prostate, the case not showing any prostatic lesion until autopsy.

Dr. Algernon B. Reese, New York: I should like to cite a case of pseudotumor of the orbit with some unusual features. The woman had a proptosis of the right eye, and through the upper and lower lids, at the inner canthus, a mass was palpable. An aspiration biopsy was taken, and this showed the usual chronic inflammatory granuloma. In the course of six months the eye receded, and a slight enophthalmos ensued. After six months the left eye protruded, and through the lower lid, at the external canthus, a mass was palpable. The exophthalmometer readings showed that the left eye was 6 mm. more prominent than the right. This difference between the two eyes was not due entirely to the exophthalmos on the left side, but also to the enophthalmos on the right side. After one month the difference in the two eyes was only 2 mm.; in another month it was only 1 mm., and three months later there was an enophthalmos of the left eye. The eyes remained the same for two years more and then the left eye protruded again 5 mm. At the same time there appeared a large, smooth, somewhat firm mass over the forehead, and an aspiration biopsy showed that it was a chronic inflammatory granuloma. After two months the exophthalmos began to recede, until it was only four mm. In two months more it was only one mm. Six months later there was an enophthalmos of two mm; that is,

the exophthalmometer reading on the left eye was 15 and on the right eye 13. The only possible indication of the etiology was that the X-ray examinations showed an elevation of the outer table of the frontal bone, and there was a denseness in both antra, thus suggesting the possibility that an inflammatory granuloma had extended from the sinuses into the orbit and over the frontal bone.

DR. PHILIP M. LEWIS, closing: I wish to thank the gentlemen for their discussion. There is just one thing I want to say. I believe that, in these cases, even if we are suspicious that they are of chronic inflammatory origin, we should give the patient the benefit of a biopsy, rather than wait to see what may happen, because the condition might not be of inflammatory origin.

CHLOROMA*

REPORT OF A CASE WITH HEMATOLOGIC STUDY

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Since exophthalmos is usually the first symptom of chloroma, a discussion of these cases deserves a place in ophthalmic literature, even though the subject remains primarily in the realm of the hematologist. A complete review of the literature would be superfluous at this time, since this has been done so recently by Gump, Hester, and Lohr.[1]

The gross anatomic features of chloroma were first described by Burns[2] in 1823, who noted the green orbital tumors and fatal outcome. King[3] was the first to use the name chloroma in 1853. Von Recklinghausen[4] in 1885 mentioned that the histologic pictures of chloroma and leukemia were similar but made no correlating blood studies. In 1893 Dock[5] discussed the relationship between chloroma and leukemia, and in 1904 he and Warthin[6] definitely established this relationship. In 1910 Lehndorff[7] reviewed the 73 cases which had been reported and considered 56 of these to be of lymphoid origin. Inferior hematologic methods and the generally accepted lymphoid nature of chloroma were probably responsible for the slow recognition of the myeloid nature of the disease. At the present time, most hematologists agree that the process is myelogenous.

In many of the cases that have been reported as chloroma, the diagnosis may be considered doubtful. In several instances there was neither biopsy nor autopsy; hence the green color and other characteristics of the tumor were not disclosed. This is particularly true of the cases reported by Gould and LeWald[8] in which the separation of the suture lines of the skull was stressed as an important diagnostic sign. Although this is evident in some cases, it is a rare finding. Their diagnosis may be questioned also because the blood examinations did not show leukemia, the biopsy of the lymph glands did not show the green color, and autopsy was not performed. True aleukemic forms of the disease are rarely encountered, but relatively aleukemic stages may be present.

Brannan's[9] review in 1926 left little doubt of the myelogenous nature of the

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process and suggested that many cases previously reported as chloroma were of doubtful authenticity. Nevertheless, of seven cases reported by Feer[10] as late as 1927, three were classed as lymphoid, but one of these was diagnosed as lymphosarcoma at autopsy. His second case showed leukopenia and nearly 90 percent lymphocytes. In none of these cases was oxidase or supravital-staining technique used. Even the oxidase reaction does not differentiate lymphocytes from myeloblasts, and it is easily seen that immature myeloblasts may have been mistaken for lymphocytes.

As yet there have been no cases of definitely proved chloroma in which the outcome was not rapidly fatal. Washburn[11] in 1930 reported a case with cure by roentgen therapy two-and-one-half years after appearance of the tumor. This patient had a definite but moderate leukemia with an abnormal number of immature cells of the myeloid type (myelocytes) ranging from 5 to 26 percent. A green tumor of the frontal region was found at biopsy. According to a recent communication from the author, the child is still living. Distinguished pathologists in various parts of the country recently have examined sections of tissue from the tumor, but they have failed to agree on the diagnosis. Some have called it xanthoma, some chloroma, and others have been unwilling to classify it. Washburn says, "My own feeling is that in referring to the case it should be mentioned that the diagnosis of chloroma is open to question in spite of the fact that I still believe it is the most plausible diagnosis." This is the only case in which roentgen irradiation was administered in a relatively long course of small doses rather than in full erythema doses. It may be significant, also, that the treatment covered practically the entire body and was not confined to the visible manifestations of the tumor. In 24 treatments over a period of six months, the entire body was irradiated except for the hands and feet. Washburn was unable to find in the literature that similar treatment had been used in any other case of this type, nor was I. At the conclusion of the treatments, the blood count was normal and no immature forms were evident.

Several other writers, including King[12] and Merculov,[13] have reported apparent temporary benefit from local irradiation. On the other hand, Gamble[14] and other observers have reported rapid progression of the disease in spite of roentgen treatment.

In many of the articles on chloroma, too much stress has been laid on so-called characteristic findings such as separation of sutures, involvement of the bones of the skull, papilledema, subconjunctival hemorrhages, which really represent individual manifestations that may or may not be present. This has led to considerable confusion, in that the absence of these conditions may tend to lead the observer away from the diagnosis. Why make it hard? The subjective and objective signs and symptoms are dependent merely on the situation of the tumor, which may be at any place in the body.

It is necessary, then, that a clear definition of chloroma be made, if possible. Localized growths of myeloid elements anywhere in the body, as demonstrated by biopsy or autopsy, and myelogenous leukemia, progressing rapidly to a fatal termination, are the outstanding features of the disease. It appears more often in children. When adults are affected, the condition seems to occur more frequently after the fourth decade. The underlying pathologic change consists of a primary hyperplasia of bone marrow which may produce masses of immature white blood

cells beneath or in the periosteum of the flat bones with metastasis through the blood stream to distant tissues. The hyperplastic areas in the bone marrow increase in size and the bony trabeculae become rarefied. If they break through, they produce flattened greenish tumors over the inner surface of the skull, the vertebrae, and the ribs. The diagnosis cannot be made by roentgenographic or blood studies alone. The green color should be present if the term chloroma is to be employed. However, Gump, *et al*[1] state that the tumors may not be green.

Thus far the cause of the green color of the tumors has not definitely been determined. It is assumed that it is bound up in some way with the metaplasia of the myeloid cell which is peculiar to this type of leukemia, but this color is not necessarily characteristic of the color of bone marrow in other types of leukemia. Boots[15] showed that the color fades rapidly on exposure to light and air and that formalin specimens become green again in hydrogen peroxide. He also found the green color in the buffy coat of the white cells in a case of myelogenous leukemia, but not in the cells from a patient with lymphatic leukemia whose white count was equally high.

Chloroma is definitely a leukemic disease and may be considered as an unusual form of myelogenous leukemia. In this sense it is a distinct entity. Its neoplastic properties cannot be questioned, and chloroma in myelogenous leukemia may be a counterpart of lymphosarcoma seen in lymphatic leukemia.

Case report

A white boy, aged four years, was examined on November 23, 1935, because of a swelling in the left upper lid. This had appeared about two months before and had increased in size, gradually at first, but for the last two weeks had displayed rapid growth. The child felt perfectly well and had no other complaints. Except for whooping cough a year before the child had had no illnesses, and his birth and development had been normal in every way.

Physical examination revealed that the boy was well nourished and of normal development. He weighed 32 pounds. Except for a few palpable posterior cervical and axillary lymph nodes, exophthalmos and downward displacement of the left eye were the only abnormal findings. The exophthalmos was caused by a circumscribed hard tumor mass slightly visible, somewhat nodular, between the globe and the lateral portion of the roof of the orbit. It apparently extended far back in the orbit and was somewhat adherent to the periosteum, causing proptosis of 8 mm. and downward displacement. There was no edema of the conjunctiva, the cornea was clear, the pupil round and equal to that of the right eye and normally active. No lagophthalmos, loss of motility, nor diplopia could be demonstrated. The vision was normal, as far as could be determined by illiterate tests, and the fundus showed normal findings (fig. 1).

The family physician reported that examination of the urine and blood had shown nothing abnormal. A roentgenogram of the skull and orbit revealed no bone change nor destruction.

The patient was admitted to the University Hospital on December 2, 1935. In the interval since examination there had been a noticeable enlargement of the tumor of the left orbit, and, in addition, another tumor had appeared in the same position in the right orbit. This was not detected until the child was anesthetized for operation. The blood count at this time showed 32,000 white cells, with approximately 82 percent myelocytes.

Operation was performed on December

5, 1935. Incision through the skin and fascia of the upper lid exposed a circumscribed tumor mass of distinctly olive-green color. The mass was easily separated from the surrounding tissues on the left, and did not include any of the lacrimal-gland area. Palpation of the orbit through the incision revealed no evidence of other tumor masses farther back in the orbit, and when the sutures

Fig. 1 (Frost). Photographs of patient showing supraorbital tumor and exophthalmos (December 1, 1935).

(fig. 2). It was somewhat adherent to the periosteum of the roof of the orbit and the supraorbital ridge, but not a part of it. It was not adherent to the were in place, there was little displacement of either eyeball.

The tumor from the left orbit measured 3 x 3 x 1 cm., was convex against the roof

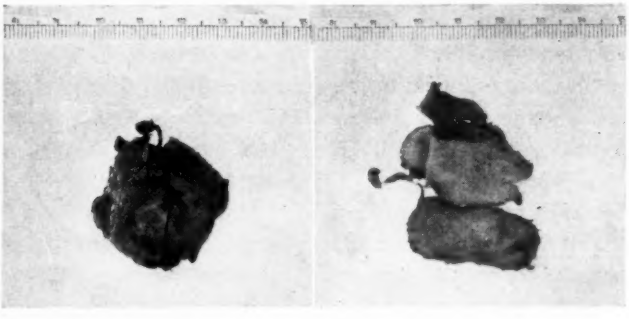

Fig. 2 (Frost). Tumor removed from the left orbit (December 5, 1935).

sheath of the superior-rectus muscle. The latter portion occupied the normal situation of the lacrimal gland. The tumor in the right orbit was also removed. This was less than half the size of the one of the orbit, and somewhat concave in its lower part to fit the contour of the globe. The gross examination of the tumor and frozen sections established the diagnosis of chloroma (fig. 3). It was firm and of

a dirty-green color. It had an elasticity suggestive of fibrous-tissue proliferation. Its contour was fairly smooth, but the mass was not covered with a membrane, nor was it encapsulated. Section of the growth showed a fibrous-tissue background infiltrated with round cells. There was a large portion of lacrimal gland attached to and associated with one margin of the tumor. The glands were quite normal in appearance, with only slight cloudy swelling presumably caused by some vascular disturbance. The process appeared to be one of extension into, rather than of primary involvement of the lacrimal gland.

After the operation, the child's general condition was satisfactory except for a slight elevation of temperature daily in the afternoon to 100.5°F. There was constant drainage of blood and serum from the incisions which required changing of dressings each day, but there was no infection in the wounds. Nevertheless, the child displayed progressive weakness with a rapid drop in the number of red blood cells and in hemoglobin content. A transfusion of 250 c.c. of citrated blood six days after the operation was followed by a chill with a rise of temperature to 104.5°F. Later the temperature fluctuated between 99 and 100°F. The oozing from the wounds ceased, they healed promptly, and there was much improvement in the patients general condition, except for an occasional complaint of pain in the eyes. By December 18th, the boy was able to be up and about the ward, at which time the admission weight of 32 pounds was still maintained.

On December 24th, he was allowed to leave the hospital for the Christmas holidays, on condition that he return. Except for weakness and anemia, his general condition was good. There was no evidence of recurrence or new tumors. Between January 14th and January 22d, the patient received a course of roentgen therapy over the parietal regions. A total of 2,400 roentgen units was administered in eight applications. There was little change in his appearance and condition during the month of January. His appetite was good and his weight was maintained. He did not return to the hospital until January 27, 1936.

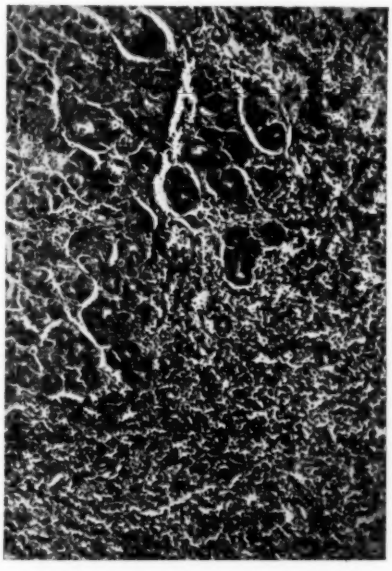

Fig. 3 (Frost). Section of tumor removed from the left orbit, showing invasion of the lacrimal gland. × 150.

Following a transfusion, on February 5th, of 375 c.c. of citrated blood into the jugular vein, the child contracted chickenpox and was transferred to the Isolation Hospital where he remained until February 18th. On February 14th a mass was palpated beneath the lower lid of the right eye. This grew rapidly. A smaller mass also was palpated in the same position in the left orbit (fig. 4). Right facial paralysis and deafness, along with some swelling in the right temporal region and cheek were discovered, but these symptoms improved after irradiation therapy.

At about this time the patient began to complain of severe epigastric pain which

was relieved only when he sat upright. The tumor mass in the right orbit enlarged rapidly. Because of increasing exophthalmos and severe pain, the mass was removed through an incision in the lower lid on February 20th. This growth measured 3 x 2½ x 2 cm., and was pathologically identical with those that were removed earlier (fig. 5). Bleeding and oozing through the dressings were continuous. The patient's temperature rose to 105 degrees and death was expected. The day after the operation, 150 c.c. of blood was withdrawn and 350 c.c. of the father's citrated blood immediately supplied. The next day the condition of the patient was so much improved that the procedure was repeated three days later. A single treatment with roentgen rays (600 r) was administered on February 29th.

Fig. 4 (Frost). Photographs of patient (February 14, 1936). Note right facial paralysis.

Fig. 5 (Frost). Tumor removed from the floor of the right orbit (February 20, 1936).

The tissues about the wound became swollen and edematous from a large hematoma. There was no healing nor granulation and the tissues became gangrenous beneath the skin of the cheek and temple. About two weeks after operation, the patient was taken to the operating room and the wound was thoroughly cleansed and irrigated. His condition improved after this and his temperature dropped to between 99 and 100°F. There was less discharge from the wound, and the patient was much more comfortable.

The tumor mass previously palpated in the floor of the left orbit had disappeared, probably as the result of irradiation, but the exophthalmos increased gradually. Numerous lesions then appeared in the form of skin nodules which later broke

down into abscesses of the chin, forehead, and outer canthus of the left eye. At first these appeared to be firm and nodular, but rapidly became necrotic, punched-out ulcers discharging foul, purulent material. No biopsy or cultures were made of these, but they probably were not chloroma. There was marked swelling of both anterior and posterior cervical lymph nodes; one of these nodes was removed for biopsy.

The right temporoparietal region displayed increased thickening, apparently due to elevation of the periosteum and increased thickness of the bone, but repeated roentgenograms showed no evidence of bone change throughout the patient's entire course.

About three weeks after the last operation (March 12, 1936) the patient complained of severe pain in the abdomen, and the next day there was marked abdominal distention which was not relieved by an enema or other measures. The output of urine was scanty and there were no stools. Four days later the distention was somewhat relieved by involuntary stools and urination. This was accompanied by rectal prolapse and bleeding. Coughing increased, the child's breathing became labored and his temperature rose to 104 degrees. His condition became progressively worse during the few days until his death on March 19, 1936.

Necropsy. The child's body was examined after death and revealed the following abnormal findings: The soft tissues around the right eye were ecchymotic, swollen, ulcerated, and injected. There was slight edema and ecchymosis of the cornea. No nodules were palpable on the bones. The mesenteric lymph nodes were slightly enlarged. The left thoracic cavity contained a slightly increased quantity of fluid. There were adhesions between the posterior surface of the left lung and the vertebral column. They were firm and represented the growth of a tumor from the vertebral column into the thoracic cavity with extension to the lung. The sternum showed a slight bluish nodularity on the left side, extending from the first rib into the first interspace and adjacent to the periosteum in this region. The spleen weighed 110 grams, and there were some small accessory spleens at the hilus. The left kidney weighed 110 grams and the right kidney 80 grams, but neither showed anything remarkable on cut section. The peripancreatic lymph nodes were markedly enlarged.

The bone marrow in the left femur was examined; it was hyperplastic, grayish-red in color, and of a seminecrotic type. There was a heavy infiltration of a greenish-yellow tumor over the vertebral periosteum at the approximate level of the third thoracic vertebra, with extension downward to the mid-lumbar region. The growth extended over the left border and the side of the vertebra and into the thoracic region and stood out over the adjacent portions of the ribs. On cut section the tumor was very firm, and of a dirty yellow-green color with foci that looked to be hemorrhagic and necrotic. The appearance of this tumor was identical with that primarily removed from the left orbit and also the right orbit. The dissected vertebrae showed apparent extension through the neural foramina into the vertebral canal with compression of the spinal cord. This pressure was exerted from a posterior position, since none of the tumor tissue was anterior to the cord. The dura of the canal appeared to be intact and showed no evidence of penetration by the malignant growth into the subdural space.

Microscopic examination of tissues. The characteristic feature of the case was that of subacute myelogenous leukemia, with marked primary hyperplasia of the

bone marrow and infiltration or hyperplasia of primitive cells of the granulocytic series, particularly in the peri-

kidneys, and pancreas. The peculiar dirty grayish-green character of the tumor, its predilection for periosteum, and the es-

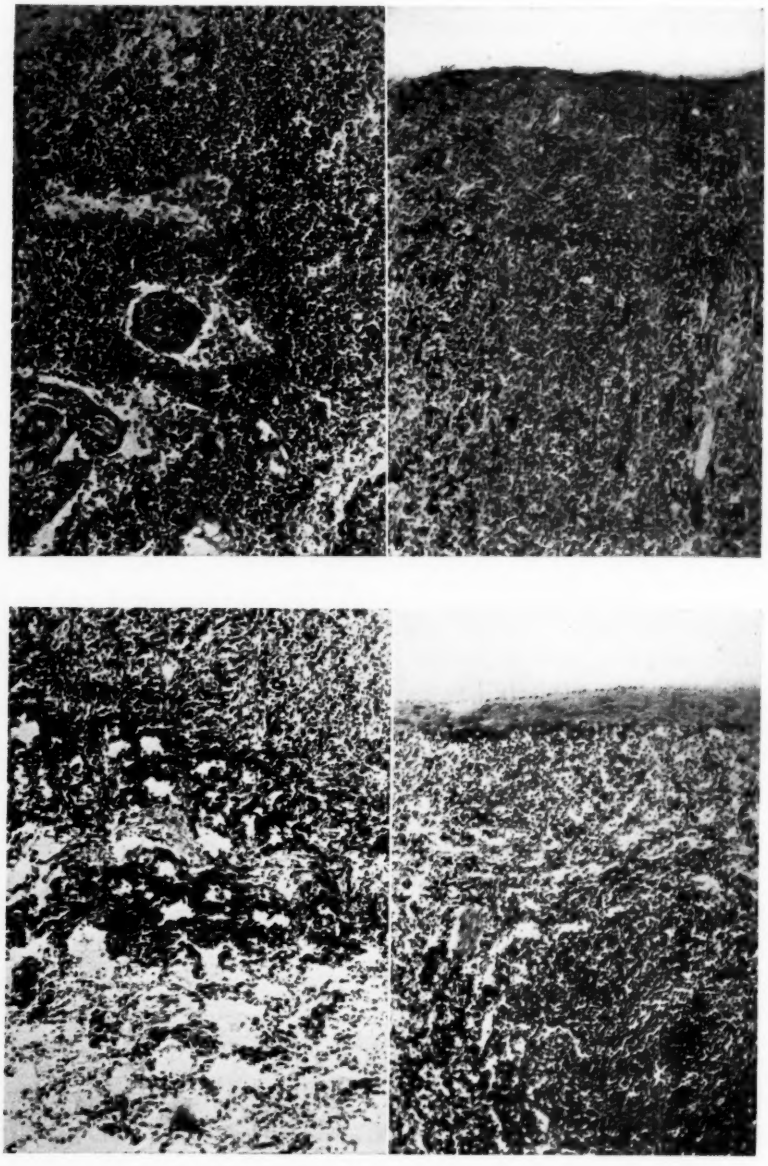

Fig. 6 (Frost). Sections of: a, lymph node; b, periosteum; c, lung; and d, spleen. ×150.

osteum, to a moderate degree in the lymph nodes, and with no infiltration into organs most commonly involved in myelogenous leukemia, such as the liver,

tablished myelogenous leukemia placed it in the class of tumors called chloroma (fig. 6).

The patient's symptoms were directly

dependent upon the disturbance of function by growth of the tumor in organs in immediate proximity to the sites of invasion of the periosteum in the orbits and spinal column. Death was due to disturbance of metabolism, paralysis of compression myelitis, terminal septicemia, and lobar pneumonia.

Hematologic study. After the diagnosis was established by the blood count and the biopsy of the orbital tumors, the patient was placed under the care of Dr. B. K. Wiseman, of the Department of Medical Research, who made a thorough study and has tabulated the blood findings in the accompanying chart (fig. 7).

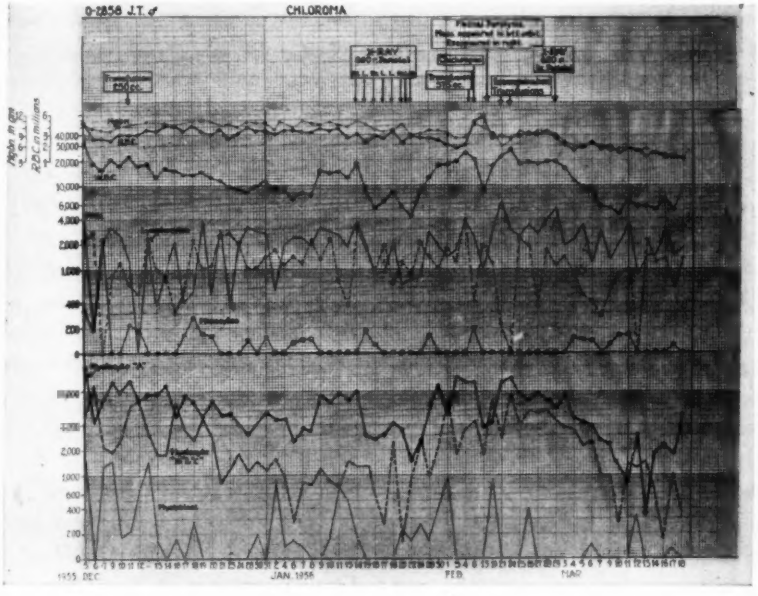

Fig. 7 (Frost). Chart showing complete blood picture during patient's entire course. Note particularly the fluctuations following blood transfusions and roentgen therapy.

In common with most of the previously reported cases of chloroma and of acute myeloid leukemia, the blood picture of this patient shows the dominance of relatively immature cells of the myeloid series. While the white blood cells of the various types fluctuated in numbers from time to time and in response to various therapeutic procedures, for the most part myelocytes of the very young, or "A" type represented about one half of the circulating white cells. Unlike most cases of acute myeloid leukemia, however, myeloblasts in large numbers appeared only infrequently and did not tend to increase either in relative or absolute numbers as the disease progressed. In common with leukemia in general, a marked anemia and thrombopenia were shown throughout the course of the disease.

The response of these circulating elements to certain therapeutic procedures and circumstances that supervened during the course of the study of this patient are shown in figure 7. On December 11th, after transfusion of 250 c.c. of citrated blood, there was a gradual but definite fall in the total white-blood-cell level from more than 20,000 to approximately 8,000. The reduction in cells consisted chiefly of the young myeloid cells.

The fall in the myelocyte A, B, and C type, and particularly in myeloblasts, was outstanding. With the diminution in young myeloid cells, there was a gradual rise in mature neutrophiles and lymphocytes. This remission lasted until approximately January 6th, at which time there was an increase in the total number of white blood cells and in immature myeloid cells.

On January 13th, deep irradiation was administered over the right parietal region, with reduction in total white blood cells and myelocytes of much less magnitude than that following the blood transfusion. Immediately after discontinuance of roentgen therapy, the white count began to climb, with a particularly prominent increase in immature cells of the myeloid series.

The patient contracted a mild case of chickenpox on February 6th. Little change in the blood picture followed this infection, which is of interest since infections in the course of myeloid leukemia often are followed by temporary marked remissions in the basic leukemic state.

Following exsanguination transfusions which were given on February 21st and 24th, the white-blood-cell count fell gradually from about 20,000 to an approximate level of 5,000, with a marked diminution in young myelocytes and myeloblasts. About March 10th, there was a recrudescence in the activity of the disease, with accompanying rise, particularly in myelocytes A, until death supervened.

The type of cell involved in this case had the usual characteristic signs of immature myeloid cells. Some of the myelocytes had two nuclei and many had multiple nucleoli, often of very large size. A large proportion of these cells contained hyalin rods, known as Auer bodies, in the cytoplasm, some of which took the neutral-red stain; others rejected this dye. In the preparation stained by Wright's technique, these rods stained to the same quality and color as the granules of the neutrophils. The significance of these bodies is not clear, but it is apparent that they occur only in the myeloid cells of the myelogenous type of leukemia. They are never seen in infectious states nor in blood dyscrasias other than myeloid leukemia, in which there is a severe shift to the left in the myeloid series. The Auer-body phenomenon persisted during the entire course of observation of this patient. The lymphocytes and monocytes showed no qualitative changes except a mild shift to the left. The total number of lymphocytes and monocytes was, for the most part, always within the range of normal.

Oxydase stain upon the cells of the peripheral blood showed a positive reaction in 85 percent; negative, in 15 percent. A supravital differential count done at the same time upon the blood showed 84 percent granule-containing cells and 16 percent nongranule-containing cells. The latter group consisted of 15 percent lymphocytes and 1 percent monocytes. Hence the differentiation of cells in the peripheral count checked very closely with the number which theoretically are oxydase positive, and further substantiated the classification of cells.

The blood studies in this case were supplemented by study of a section of a lymph node from the right cervical region. This showed that some of the nodes in this chain had the cellular content within the capsular borders almost completely replaced by immature myeloid cells. One small node, however, showed only a minor degree of infiltration of the abnormal cells. There was no change in the reticuloendothelial structures of these lymph nodes nor any alteration in lymphocytes.

Repeated examination of the urine for Bence-Jones bodies (five observations) yielded negative results. Several observations on the fragility of the red blood cells showed a very slight increase in resistance to hemolysis by hypotonic solutions, a finding which has been consistent in the studies of myeloid leukemia in the hematologic laboratory of this hospital.

Summary and conclusions

A typical case of chloroma in a boy, aged four years, is reported. These cases have a place in ophthalmic literature only because exophthalmos is so often the first symptom to bring the patient to a physician. Hence ophthalmologists must be familiar with the condition but should seek the collaboration of the hematologist, in whose domain this disease properly lies.

It is evident from the lengthy discussions in ophthalmic literature of the nature of chloroma that some authors have been led far afield in the emphasis on so-called characteristic symptoms such as separation of the suture lines, which represent merely secondary manifestations dependent on the situation of the tumor growths. At the same time there has been exhibited a failure to emphasize and even a lack of understanding of the underlying pathology of the disease, which is a particular type of myelogenous leukemia.

The diagnosis is made on the blood picture and the presence of tumor masses of a greenish color which contain embryonic myeloid cells.

Roentgen irradiation is the most satisfactory treatment, for it causes a reduction in the size of the tumors and relief of pain. If the total white cell count is high the spleen and lymph nodes as well as areas with pronounced symptoms should be irradiated, as is done in cases of leukemia. Replacement transfusions also are of value in relieving the symptoms and reducing the number of abnormal cells in the blood. Surgery should not be attempted (except for biopsy) unless roentgen therapy has failed to decrease the exophthalmos, or the eye must be preserved from destruction.

In the presence of exophthalmos with or without palpable orbital tumors, especially in children, a complete blood study with supravital-staining methods should be made by a competent hematologist, in order to establish the diagnosis. A routine blood count may fail to reveal the true nature of the condition.

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Discussion

Dr. T. L. Terry, Boston: Exophthalmos is almost invariably present in chloroma and it is often the first symptom, as the essayist has stated. Granting that leukemia is relatively rare, it is very important that leukemia with or without the green tumor should be considered in the differential diagnosis of unilateral or bilateral exophthalmos. There is very little reference to chloroma or leukemia as a cause of exophthalmos. In Spaeth's recent article (Arch of Ophth., 1937, v. 18, pp. 107-148), chloroma is mentioned, but in the symposium before the Academy in 1934 Plummer and Wilder state that exophthalmos in myelogenous leukemia is almost unknown.

That leukemia must be considered in the differential diagnosis of the causes of exophthalmos is stressed in my mind by the following case:

The patient was referred to me by an internist. The internist had already made a careful examination including blood study, X rays, and basal metabolism. The blood study showed a mild anemia, 8,000 white blood cells, and a normal differential count. The left eye was 7 mm. more prominent than the right. There were some small bright-red rounded hemorrhages in the retina near the disc in each eye. Because of the bilateral retinal hemorrhages it seemed that the cause of the trouble must be a general disease. I repeated the blood count and found many immature granulocytes and 16,000 white blood cells per cubic millimeter of blood. From subsequent studies the white blood count was found to have increased rapidly to 49,000 within a week. It was evident that the blood picture was rapidly changing from an aleukemic phase to marked myelogenous leukemia. The exophthalmos disappeared almost completely in two days following X-ray therapy to the orbit (2/3 erythema dose). In spite of a great reduction in the white count by general X-ray treatment, the patient became weaker and died within the month. Since no biopsy was done and no post-mortem examination was made, the color of the orbital tumor was not determined, and for that reason a positive diagnosis of chloroma is impossible.

Had it been suspected that the exophthalmos might have been due to a leukematous disease during the aleukemic phase, very diligent and repeated blood examinations with supravital stain might have given the diagnosis much earlier. According to Isaacs and Danielan (Amer. Jour. Med. Sci., 1927, v. 174, p. 70), the abnormal white cells are largely thrown out of the body into the intestinal tract rather than left to meet destruction in the body, and it follows that the ratio of normal to abnormal white cells in the blood and in the saliva is inversely related. Use may be made of the saliva cell count in relation to the blood count in detecting leukemia during the aleukemic phase. Allen and Dickey (Amer. Jour. Roentgenol., 1937, v. 38, p. 57) consider the correlated study of saliva cells and

blood cells of value in regulating the dosage of X-ray therapy.

The great difference between chloroma and myelogenous leukemia is the development of a green tumor in the former. The significance of the green tumor may not be known until the cause of the green color is fully understood. There have been many attempts to explain the color, as the essayist has mentioned. Thomas and Bigwood (Compt. rend. Soc. de Biol., 1935, v. 118, p. 381) thought that the green color is due to porphyrin, since they have shown by spectroscopic study the presence of free porphyrin in the tumor. They have recovered porphyrin from the tumor by extraction with glacial acetic acid and ether.

Why do these green tumors have a predilection for growth in orbital tissue? The orbit is remarkably free from lymph nodules. The orbit must certainly have lymphatic channels which have little or no connection with the lymphatic channels of the face and neck. It is possible then that the very lack of free communication of lymph channels to the face and neck may tend to produce a physiological lymph stasis in the orbit. Such a condition would favor development of myelogenous, chloromatous, or lymphomatous nodules.

The appearance of white centers, in retinal hemorrhages is presumably diagnostic of leukemia, although it is not invariably present. It is due to accumulation of abnormal white blood cells in the center of the hemorrhage. I should like to ask Dr. Frost if this is also observed at times in chloroma?

DR. GEORGIANA DVORAK-THEOBALD, Chicago: Dr. Frost's study of this case has been most complete, and his blood findings and histologic pictures are of great interest.

Chloroma is a rapidly growing malignant neoplasm involving the hematopoietic system, with metastases of cells to distant organs, and associated with a leukemic blood picture. It is almost invariably fatal, with a duration of three to five months following recognition.

Up to the present time, about 200 cases have been reported in the literature.

The most characteristic sign is the predilection of the tumors for the periosteum of the cranial bones, especially of the orbit.

The rapidity of growth and extent of the orbital tumors may give rise to a number of ocular symptoms; namely, exophthalmos, drying of the cornea (due to extreme proptosis), optic neuritis, retinitis, sluggish reactions of the pupils, anisocoria, mydriasis, conjunctivitis, cataract, exotropia, and nystagmus. In one type of chloroma the aural structures were affected.

Etiology: The tumors apparently arise from localized growth of leukemic deposits or metastases, and the tumor cells metastasize in the blood to produce leukemia.

In about half of the cases the periosteum of the orbital bones is the site of predilection. Why this is so is not known.

Differentiation between chloroma and myeloma is based on the usual blood picture of leukemia and the green-colored tumor in chloroma, and the tendency to spontaneous fracture in myeloma. As a rule the Bence-Jones type of protein is present in the urine of myeloma patients and only rarely in chloroma patients.

It is thought that the green color of chloroma is due to a lipochrome, or that it is due to a blood pigment; but nothing is definitely known. Roehn and his associates say that it is due to phagocytosis of the blood in obstructed capillaries by endothelial cells.

Histologic pathology: The tumor cells are usually large, undifferentiated mononuclears, designated as myeloblasts or

lymphocytes. Indeed, in the past, pathologic differences of opinion have centered around the lymphatic or myelogenic origin of the neoplasms. In a case reported by Roehn, Riker, and Olsen (Ann. Inter. Med., 1937, v. 10, Jan., p. 1054), pathologic examination of the tumor by Dr. C. V. Weller of the University of Michigan showed that it was neither myelogenic nor lymphatic in origin, as the tumor cell is a *primitive blastoma which might conceivably differentiate into either a lymphocyte or myelocyte.*

The possibility of tumor cells having a double potentiality of development is well brought out in Berger's theory of the "double potentiality of development" of a single neuropigmental blastoma. That is to say, the cells of the blastoma are capable of evolving either as elementary ganglion cells or Schwannian melanic elements, "for the Schwann nerve cells and the melanic cells there is a *common primary blastoma* the elements of which become neoplastic."

Gump, *et al* (Gump, Hester, and Lohr[1]) treat of monocytic chloroma, which they say is usually classed as a distinct entity; but the origin of the monocyte, whether from reticulo-endothelial elements or not, is doubted. In their case, autopsy sections of the tissue showed cells of the neoplasm in a connective-tissue reticulum, satisfying the criterion for true blastomatous neoplasm of the endothelial system.

In an early article, more than 20 years ago, Dock and Warthin,[6] who made an exhaustive study of chloroma, concluded that "choloroma is a tumorlike hyperplasia of the parent cells of the leukocytes primarily in the red marrow, the periosteum being involved."

I have seen two cases of choloroma; one with Dr. Cupler at St. Anthony's Hospital. This patient had a blood picture similar to that described by Dr. Frost. The orbital contents were sent to me after death of the patient, but are not ready for study. The second case is being successfully treated by irradiation over a period of several years by Dr. Poucher. The eyes are proptosed, but the lids have grown sufficiently to protect them properly. The proptosis is not due to a shallow orbit. The vision is normal, and the fundus shows no changes.

Dr. Albert D. Frost, closing: I thank the discussants for their interesting remarks.

Relative to the saliva count, questioning hematologists, I believe they consider this to be a very noteworthy observation but as yet a scientific curiosity, nevertheless it may be a valuable diagnostic point and should be done.

I think it unwise to indulge in a lengthy discussion of the difference in the color, since this is a much-disputed point even among hematologists, who find, for instance, a decomposed product of red cells which seemingly are rapidly destroyed in this disease. The definite anemia present, therefore, seems to be a satisfactory explanation of the phenomena. However, it is also plausible that the reaction may be due to the granule content of the predominating myelocytes, such as was mentioned by Boots.

I have not observed retinal hemorrhages in this case, nor do I find any discussion of such in the literature. Most myeloid leukemias, as I understand it, do not show the characteristic retinal hemorrhages, and they are prevalent in the lymphatic leukemias. A probable explanation may lie in the fact that in lymphatic leukemia there is more definite thrombopenia than there is in the myeloid type.

I might add that the autopsy did include a rather thorough examination of this boy's one eye, and we have never had a better section of a normal eye throughout.

APPLIED MECHANICS OF CATARACT EXTRACTION*

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Applied mechanics is sometimes discussed under two headings: mechanics of structure and machines. For the present purpose we can consider the mechanical structure of the eyeball and the effects produced by applying mechanical forces to the eyeball for removal of the opaque crystalline lens. We often think of the eyeball as a closed cavity with its outer coat distended by the pressure of its contents. But exact thinking requires that we notice that the structure of the sclerocorneal coat varies in its different parts. The sclera is hard, when compared with the structures it contains; namely, the choroid, retina, vitreous, and aqueous. But it is soft compared with the cornea. This is easily felt with the tips of the fingers through the closed lids, by any one testing the intraocular tension by the Bowman method. Change of tension is most distinct when the finger tips are placed on the thin retrotarsal portion of the upper lid; and the eye turned first strongly down and then up.

The cornea is more rigid than the sclera. When the eyeball is incised, the sclera collapses—loses its spheroidal shape, which is normally changed only under considerable direct pressure, and returns to its original shape when freed from the distorting force. The optical function of the eye requires some fixed relation between the focusing apparatus and neural percipient elements that receive the impression of light. This is met in the eyes of invertebrates as well as in the eyes of vertebrates. In the eyes of fish, reptiles, and birds, this permanent relation is attained by bony tissue in the sclera or iris.

The sclerocorneal coat is generally described as fibrous, composed of connective-tissue fibers. But in some of the amphibia it is cartilaginous. In the human eye the sclera has very much the same structure and flexibility as the tissue of the tendons, aponeuroses, and sheaths of the muscles. Its spheroidal form depends on the outward pressure of the fluid contents. As soon as this intraocular pressure is removed, the sclera collapses and is easily molded by external forces. The cornea does not collapse, but continues to preserve practically its normal curves, even after it has been wholly excised from the sclera. Its shape depends upon the permanent elasticity of the substantia propria, which constitutes nine tenths of the corneal substance. It has resiliency, power of returning to its original shape when pressed out of shape. The sclera and cornea constitute the protective coat of the eye. They are very much alike in some ways; but in this they differ: the sclera is tough, the cornea is resilient.

There is no evidence that resiliency of the cornea was recognized by Helmholtz, although he did know that in chemical composition the cornea resembled cartilage. The recent works of Duke-Elder, and of Adler, do not recognize the practical importance of this difference. It is of most practical importance in cataract extraction. Probably operators have failed to recognize it because cornea and sclera are cut by the knife very much alike; they are both parts of this "fibrous, protective tunic" of the eye.

Another point in the structure of the eye that has been known, although its importance in cataract extraction has been overlooked, is that the cornea extends under the scleral margin, making it actually

* Read before the meeting of the Western Ophthalmological Society, July 23, 1937.

larger than its apparent anterior surface. Also the cornea is thinnest at its center and thickest at its periphery. The thickness is generally given as 1 mm. at the periphery and as 0.7 or 0.8 mm. at the center. A healthy cornea may be as thin at the center as 0.5 mm., or even less. It must also be born in mind that the sclera is also thickest near the limbus, and that near this region it is stiffened by the ciliary body. These points have bearings on the mechanics of cataract extraction.

Daviel took a great step forward when, instead of merely displacing the opaque crystalline lens from behind the pupil, he removed it entirely from the eye. But he started, at first, to remove the lens with much the same instruments as he had used for couching. The incision of the cornea he made with the lancet he had used to penetrate the cornea for couching, and he extended the incision each side with scissors.

The scissors are a poor instrument for cutting the cornea; they crush the lips of the incision. This was soon realized by Daviel and others, who first tried to do the extraction operation; and knives of various forms were designed to make the whole incision. In the first 50 years of cataract extraction most of the forms of the knives were tried that have since found any favor with ophthalmic surgeons. But the mechanical conditions that had to be met in removing the crystalline lens have received very little other consideration up to the present time.

The small area within which all eye operations were to be done, and the delicate accuracy of the movements to be made soon reduced the size of the instruments to be used, and determined their forms. Thick and curved knives, suited to swift, sweeping movements, were soon found to be out of place in eye surgery. Exactness and steadiness of movement were supremely essential. The cutting edges had to be as keen, and points of knives as sharp as possible in order to avoid all unnecessary disturbance and damage to the highly specialized tissues of the eye. Forceps also must cause the least possible bruising to the tissues they seized. Operations throughout must be planned and carried out with the least possible damage to tissue nutrition and function, consistent with the removal of the opacity obstructing vision.

The experience of early operators sifted the varied forms of cataract knives to a few that were in general use 100 years ago. The thin, flat, triangular, lance-shaped knife was pushed directly forward, cutting with both edges. It makes the smoothest, safest, quick-healing corneal incisions for purposes that require only a short incision. But to make an incision long enough for the easy removal of a senile cataract, the cutting sides have to spread at such a broad angle that it is difficult to make an incision long enough to allow the easy escape of the whole lens, or a large nucleus. The lance knife has been used for most iridectomies; and Ewing and Claiborne, in America, have urged that it makes the best incision for cataract extraction. But most operators have given it up, because the broad spread of the cutting edges made it necessary to have them very sharp, to cut smoothly and easily.

Beer's knife, having much the shape of the first knife used by Bartisch, but smaller and thinner, is still well known. It cuts entirely with the inclined edge, but the straight back of the knife guides the thrust of the edge and keeps the incision filled until it is completed. It also holds the cutting edge firmly against the tissue to be cut. This knife was capable of making a straight, smooth incision of half the circumference of the cornea. Usually it was made above or below, but sometimes laterally. It is still used by many oper-

ators for various purposes, and sometimes for cataract extraction. But its point has too broad an angle readily to make the puncture and counter-puncture for the incision commonly used, the linear or modified-linear incision now popular for cataract extraction. It keeps the incision filled, preventing the loss of aqueous until the incision is nearly complete; and the width of the blade helps to steady the eyeball, and make the incision smooth and all in one plane.

When Graefe was operating for cataract, general anesthesia was used for operations in general surgery. But it was not well suited to delicate operations on the eyeball, and local anesthetics were unknown. Cataract extraction was done without anesthesia, except that afforded by a drink of brandy. It was important that the eyeball should be brought under control as quickly as possible after the operation was begun. The first purpose of the Graefe knife was to make the puncture and counter-puncture as quickly and accurately as possible. With this achieved the eyeball was well under control of the operator.

This was effected by the narrow blade and sharp point, cutting on both edges. The feeling of mastery this gave the operator at the beginning of his incision, made the Graefe knife immediately popular. It is still generally used for extraction of cataract, although it has certain important defects from the point of view of the mechanics of the cataract operation.

About the same time as Graefe, Ed. Jaeger studied cataract extraction. He sought to make a knife that preserved the advantages of the Beer knife. It has been called the "Holtzschnitt" knife. Instead of a flat blade, it had a blade curved at right angles to the cutting edge and back of the knife. It made a curved cut like that made by a chisel, having a curved cutting edge. It was used and described in this country by B. A. Randall, who studied with Jaeger in Vienna. It was narrower than the Beer knife but was used with the same straight forward thrust, and with the regular curve of the blade filled the incision so as to prevent the escape of aqueous until the incision was completed. The curve allowed the cutting edge to act more nearly perpendicular to the cornea, than could a knife all in one plane. It left a wound less liable to displacement of the flap, under pressure of the dressing. This form of cataract knife was liked by its inventor, and some of his students. But its unusual shape prevented its general use and a good understanding of it.

The Graefe narrow knife still remains in common use, and those who have modified the cataract operation of late years have generally used the narrow knife. The corneoscleral incision for cataract extraction involves certain mechanical factors that have not been sufficiently considered. For the puncture and counter-puncture the Graefe knife was perfectly planned. But when these have been made, the back of the knife loses contact with the angle of the incision, and aqueous begins to escape. The sclera, lacking the resiliency of the cornea (its power of resisting change of form), begins to be dragged out of shape. The cutting edge of the knife at first moves almost at right angles to the 1-mm. thick tissue at each end of the incision. About 2 mm. of tissue are being divided by the motion of the knife that the hand of the operator may be causing.

But as the knife advances the width of tissue divided steadily increases, and the force required to divide it must be steadily increased. This is shown in Fig. 1a, representing the tissue divided by the incision. Without thinking much about it, probably all operators have been conscious of the need of increased force to

complete the incision. The skilled operator may meet this difficulty often quite unconsciously, by changing slightly the direction of the motion of the knife. But probably all of us have been conscious at times of a slight jerk as the incision was completed. This jerk is due to the relation that the knife edge and tissue have assumed at that time. This is indicated by figure 3, exaggerated to show what occurs when the incision is completed in scleral tissue, as it often was for Graefe's modified linear incision (fig. 2). The drag on the sclera has deformed it, so that, as the incision is completed, one is cutting almost a cord of tough tissue; and the completion of the cut lets the sclera loose with a jerk. This distortion of the sclera (great convexity where it is being cut, and flattening on either side) must disturb the relations of the sclera to the uveal coat, the choroid, and the thicker, more rigid ciliary body.

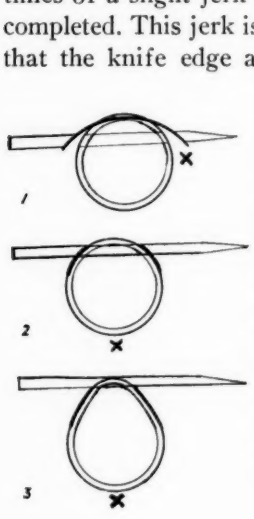

Fig. 1 (Jackson). Graefe Extraction. Incision on heavy line. Cross at fixation point, for counter puncture. Fig. 2 (Jackson). Knife at cornea above has to cut more tissue. Fixation below resists pull. Incision in corneal margin. Fig. 3 (Jackson). Cutting tissue above drags eye out of shape. Fixation below.

When the sclerocorneal resistance increases, many operators use a kind of sawing motion. If this is resorted to, the incision may be finished without any jerk. But each change in the motion is likely to bring a change in the inclination of the blade. The incision ceases to be in the original plane in which it was started; and the little angles in it interfere with the perfect apposition and healing that may be obtained when two smooth plane surfaces are brought together.

The distortion of the sclera, above alluded to, is increased by firm and forcible fixation of the globe by forceps. This becomes necessary when the pressure of the back of the knife against the tissue ceases to balance the pressure of the cutting edge, after the puncture and counterpuncture have been made. This distortion from fixation has often been forgotten, but may be a dangerous complication of the operation, if the fixation forceps are entrusted to the hands of an assistant who does not realize the dangerous effects of pressure with the forceps on the globe. The force applied in fixation to prevent the rotation of the globe before the edge of the knife may also greatly disturb the relations between the sclera and the uveal coat.

The placing of the corneoscleral incision has a very important mechanical bearing on the subsequent healing of the wound. A smooth, plane incision entirely within the cornea is an ideal wound for healing. The resiliency of the cornea brings and maintains perfect apposition of the divided surfaces. When a portion of the wound is in the sclera the cornea will help to keep it in position. But the scleral portion with the blood that may be in it may be a source of complication.

An incision in the clear cornea, as seen from the front, is wholly in the cornea. It leaves a ring of cornea attached to the thick anterior part of the sclera. This ring is a triangular section and varies in thickness. But it is thickest above and below, where corneal sections are generally made in cataract extraction. This ring, reinforced by the thickened sclera and the ciliary body, has much the resiliency of the cornea, and will hold the lips of the incision in close, normal apposition. When the puncture and counterpuncture are

made in the sclera, as they often are to get a longer incision, this corneal ring is broken and disabled for its function of holding the lips of the incision in good apposition for healing. It has been the object of the writer to place the corneal incision exactly in the corneal margin, turning back the cutting edge as the incision was completed, in order to get a conjunctival flap, where this seemed desirable.

Mechanical details are important as to the opening of the lens capsule. When Herman Knapp published his method of opening the capsule, with an incision parallel to the corneal incision, a trial of this method seemed to show that it was satisfactory, and the peripheral opening was adopted. The shape of the old cystitome was such that it was hard to clean. Nothing but boiling water could secure asepsis. It was an additional instrument that could not be used for any other step in the operation. It was good to be rid of it.

The posterior capsule takes little or no part in the production of secondary cataract. It is simply a glass membrane. The cells and nuclei that lined it in the beginning have all gone to form the fibers of the young lens. The membrane has no tissue that can proliferate. Opening the capsule by an incision parallel to that in the cornea gives easy exit to the lens; and the passing of the nucleus sweeps away any cortex that may adhere to the anterior capsule. Among the 49 cases recently tabulated for the late results of cataract extraction, showing good vision after 2 to 27 years, only eight required any secondary operation for capsular opacity. Such opacities have usually followed the effusion of blood into the anterior chamber, or the exudate of severe uveitis. The excision of a piece of the capsule is a more complicated operation than opening it with a simple cut; and where the capsule is not opaque and thickened, as by anterior polar cataract, the simple opening is wholly satisfactory.

A mechanical point that is often overlooked is that the corneal section is always smaller at the inner surface than at the outer surface. But the section is better lengthened by including a greater part of the corneal boundary than by making the puncture and counter-puncture in the sclera, thus dividing the corneal ring, and losing the power of that lip of the incision to retain its shape for accurate apposition.

It should also be remembered that with capsulotomy the incision does not have to allow the removal of the lens as a whole, but only the removal of the firm nucleus. This incision in the capsule strips off the loose cortex from the nucleus, which is rarely as much as 6 mm. in its greatest diameter. If the incision is not long enough, it easily enlarges by tearing at the ends. The cortex remaining in the capsule disintegrates, without causing uveal inflammation. It prevents closure of the capsule opening, and usually no opacity of either cortex or capsule remains in the pupillary opening. The "Indian intracapsular extraction" may be justified for people who come hundreds of miles, and can only remain a few days. But for patients who can remain in a hospital or home, and be under observation so long as is best, there is no justification for removing the capsule and breaking down the normal division between the anterior and posterior contents of the eye.

The effect of the corneal section on the curvatures of the cornea is generally to cause or increase astigmatism against the rule. This effect is greatest soon after the corneal wound has closed, and gradually diminishes afterward. But some part of this effect remains permanently. Even after the astigmatism has decreased until it has reached the permanent difference of the principal meridians, there is often

a slow increase of hyperopia, which may go on for two or three years. This definite change, which can be measured by accurate methods, indicates the long time required for full adjustment of the eye after the mechanical changes made by cataract extraction. It emphasizes the need to avoid all unnecessary damage or alteration of the eye by operative interference.

This last point is also emphasized by an observation of the late William F. Norris, when professor of Diseases of the Eye in the University of Pennsylvania and president of the American Ophthalmological Society. He made sections of eyes that had recovered from cataract extraction, and had been subsequently removed for various reasons, or *post mortem*. In all of these he found the eye had healed with the corneal flap riding up on the scleral stump of the wound. He examined Becker's Atlas and found in all such eyes there represented that the same condition had been present. The manner of cutting the corneal section always made the wound oblique to the corneal surfaces, so that the corneal lip always overlay the scleral stump.

In the days when the Graefe knife was being used in almost all cataract extractions, the Graefe flannel roller, "pressure bandage" was popular as the dressing for all sorts of wounded eyes, including those from which cataracts had been extracted. It was used on Dr. Norris's patients, and probably on all the eyes figured in Becker's Atlas. Pressure was relied on to prevent inflammation. External pressure, without even the resilience of the cornea to resist it, compressed the eyeball, forced the two lips of the corneal incision to slide together, and they healed in the position in which Dr. Norris found them.

The exact mechanics of cataract extraction, if carefully studied and applied, make possible a safer, simpler, more reliable operation for removal of the opaque lens than we have in many of the modified operations that have claimed attention of late years. If a safer, simpler operation gives a clear pupil, after a few weeks for absorption of the remaining cortex, there is, in this country, no justification for the Indian intracapsular operation that allows the patient to leave in a few days for a long journey to his home.

In very few eyes will the postoperative astigmatism have reached its permanent amount in less than two months. And the eye left without its lens-capsule-ligament diaphragm is not so safe for meeting possible emergencies in the closing years of life. In a few patients with heavy lids, and the habit of squeezing them together, the corneoscleral, or conjunctival suture, may be needed. But for most patients the uncut corneal ring is a better guarantee of smooth healing. With a knife such as has been described, filling the incision until it is complete, and keeping the eye steady, with little stress on fixation, the stitch in the rectus tendon for fixation is quite superfluous. Mechanical details may seem trifling; but they are the trifles that make perfection. And perfection of operative technique is no trifle.

Republic Building.

A PAPILLARY TYPE OF BÉAL'S CONJUNCTIVITIS*

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In 1935 a minor epidemic among students at the University of Iowa of an acute follicular conjunctivitis corresponding in all respects with the type described by Béal[1] in 1907 was reported by the writer.[2] The principal characteristics of the disease were (1) follicular hypertrophy of the conjunctiva most marked in the lower fornix, (2) an enlarged preauricular gland, (3) scanty secretion consisting predominantly of mononuclear cells, and (4) complete resolution in from one to three weeks. No significant bacteria were found in the secretion or scrapings or in culture. The disease resembled closely the follicular type of inclusion conjunctivitis but differed in the predominance of mononuclear cells in the secretion, in the absence of inclusion bodies, and in the shorter duration.

Since reporting this epidemic, the writer has recognized the disease in sporadic form both in Iowa and in New York. Thirteen cases, typical in all respects, have been recognized among the 670 consecutive cases of conjunctivitis studied at the Vanderbilt Clinic over a period of 18 months. As with the Iowa cases, no significant bacteria could be found in scrapings or culture and no inclusion bodies could be demonstrated. The disease was observed only in adults, was bilateral in all but one instance, and had no apparent association with disease of the upper respiratory tract. During this same period only two cases of inclusion conjunctivitis were observed in adults (10 in infants). Since only 24 cases of follicular conjunctivitis of all types were observed, the Béal variety would seem to be one of the more common. There was no difficulty in differentiating it from chronic follicular conjunctivitis or from the types caused by inclusion virus or drug idiosyncracies.

In the course of studies on conjunctival

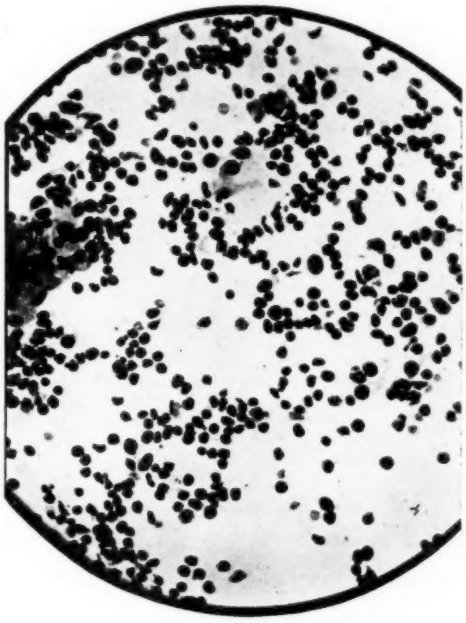

Fig. 1 (Thygeson). Mononuclear-cell exudate from the conjunctiva of a case of acute conjunctivitis, believed to belong to the entity known as acute follicular conjunctivitis of Béal. Giemsa stain. ×400.

inflammations, there has been observed an acute papillary conjunctivitis having conjunctival changes closely resembling Koch-Weeks and pneumococcic conjunctivitis (the two types of acute conjunctivitis most frequent in New York), but differing from them in the absence of bacteria and in the presence of a scanty secretion, preauricular adenopathy, and

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mononuclear-cell predominance in the secretion. The cases have required on the average about one week for healing and no recurrences have been noted.

Such cases were formerly classified as acute catarrhal conjunctivitis probably of bacterial origin but in which the infectious agent had been missed because of incomplete or late examination. In view of the characteristic cytologic picture (fig. 1), not seen in bacterial cases in which neutrophilic leukocytes predominate during the acute stage, it is believed that these cases represent a papillary form of Béal's conjunctivitis. There would seem to be a parallel here between Béal's conjunctivitis and trachoma and inclusion conjunctivitis in which follicular and papillary types are recognized.

Conclusions

A type of acute papillary conjunctivitis, previously designated as acute catarrhal conjunctivitis of unknown etiology, is identified with the entity known as acute follicular conjunctivitis of Béal. The occurrence of Béal's conjunctivitis in New York is recorded. No information regarding etiology is as yet available, but the absence of bacteria suggests that a virus may be concerned.

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THE USE OF PAREDRINE IN CYCLOPLEGIA*

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The reaction of certain organs to drugs that are factors in the pharmacology of the autonomic nervous system was described by Myerson and Thau.[1] They showed that in addition to other effects in the eye the cholinergic drugs, such as acetylcholine and prostigmin, have a synergistic action in stimulating the accommodation, whereas the adrenergic drugs, like atropine and benzedrine, are synergistic in their action in causing a paralysis of accommodation.

Reviewing briefly the earlier concept of the bodily functions controlled by the autonomic nervous system, a balance was thought to exist between the activities of the sympathetic and the parasympathetic systems which resulted in the normal function of the organ. Such a balance exists chemically between acetylcholine produced in the parasympathetic system, and the sympathins supposedly produced in the sympathetic system. Since the sympathins were considered to be similar to epinephrin, the chemical balance was interpreted as the result of effects between cholinergic and adrenergic substances. The cholinergic substance, acethylcholine, causes whatever activity parasympathetic stimulation produces. The presence of an antagonist in the form of choline esterase was demonstrated to be present in the tissues by Stedman. This esterase acts to destroy acetylcholine, thereby limiting the action of the parasympathetic nervous system. No such antagonist to the action of sympathin is as yet known, however. Myerson and Thau believed it possible that the esterases play an important part in the contraction of the ciliary muscle, and suggested that, while acetylcholine is being produced in the presbyopic eye, there is an excessive amount of the esterase present, reducing the power of accommodation. When prostigmin, the synergist of acetylcholine, was used in the eye together with acetylcholine, the effect of the esterase was abolished, and the accommodation was increased.

The paralysis of accommodation produced by atropine was explained by the fact that atropine alters the chemical reaction by blocking the effect of acetylcholine in preventing the latter from reaching the reacting cells. It therefore (1) dilates the pupil and paralyzes the constrictor muscle of the iris, thus bringing about an absence of the light reaction; (2) increases the intraocular tension, since the action of the parasympathetic system is to lower the tension; and (3) paralyzes the accommodation of the lens, since the ciliary muscle is cholinergic in function.

Benzedrine was shown to act adrenergically on the eye in all respects, by dilating the pupil, decreasing the light reflex, increasing the intraocular tension, and decreasing the capacity of the lens to accommodate to the near point.

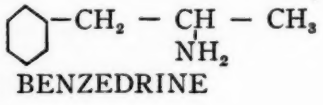
The synergistic effect of atropine and benzedrine was shown to be striking, since a combined instillation of minimum dose produced a marked mydriasis and cycloplegia, with a slight increase in the intraocular tension. Myerson and Thau explained that atropine acts as a synergist of any adrenergic drug by removing the acetylcholine action as a brake or check on the adrenergic activity, and suggested

* From the Department of Refraction, Wills Hospital. Read before the Section on Ophthalmology, College of Physicians of Philadelphia, March 17, 1938.

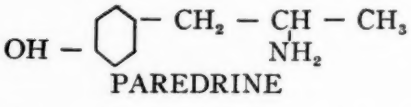
that this synergism might be useful clinically, since it was possible thereby to produce complete cycloplegia of very short duration.

Paredrine

Paredrine is a sympathomimetic drug (Parahydroxy benzyl methyl carbinamine) that is very closely related to benzedrine. The chemical structure of paredrine differs from that of benzedrine in that the former contains an OH group.



BENZEDRINE



PAREDRINE

The results of a clinical investigation of paredrine were recently published by Abbott and Henry.[2] It was shown to be a sympathomimetic drug that is nonirritating to the mucous membrane, especially when used on the nasal mucosa. When dropped into the conjunctival sac, it was found to produce mydriasis, the maximum effect being noted in 60 minutes, and lasting about 6 hours. The mydriasis could be readily neutralized by miotics. The intraocular tension was tested in five patients who received instillations of solution of 2-percent strength, but no increase in the pressure was noted in any.

Since paredrine showed the same effects as benzedrine with respect to the action on accommodation of the eye, and since it was less irritating and also without any demonstrated effect on the intraocular tension, the present writer felt that it might be a more desirable drug to use, in combination with atropine or homatropine, in order to obtain cycloplegia for refraction.

Beach and McAdams[3] had obtained satisfactory cycloplegia for refraction by the use of atropine and benzedrine, as well as of homatropine and benzedrine. They employed one drop of a 1-percent aqueous solution of benzedrine sulphate three or four minutes after the instillation of one drop of a 5-percent solution of homatropine hydrobromide. In the younger patients, the benzedrine sulphate was used after the instillation of one drop of 1-percent atropine sulphate. In some instances a second drop of the cycloplegic was instilled. Because it was thought that the benzedrine dilated the tear passage, thereby permitting the escape of the cycloplegic, it was decided to instil the atropine or the homatropine first. These writers found that complete cycloplegia could be obtained in from 50 to 70 minutes in all their cases. In those in which homatropine had been used, the accommodation of the eyes returned to normal within almost the same day, while after the use of atropine, it became normal in 3 to 4 days.

Following the report of Beach and McAdams, a similar investigation was conducted by Powell and Hyde,[4] who used an aqueous solution of 0.25-percent benzedrine and 2-percent homatropine. They instilled two drops of the benzedrine solution, followed in three minutes by two drops of the homatropine. They reported the effect on 39 patients of different ages as to the accommodation, the size of the pupil, and the duration of the cycloplegia. There was a paralysis of the accommodation in all cases after the expiration of one-half to one hour. The pupils were dilated to maximum, and in most of the patients the accommodation had returned in about eight hours.

Procedure

Into the eyes of patients less than 16 years of age, one drop of 1-percent atropine sulphate was instilled, and after a three-minute interval one drop of a 1-

percent aqueous solution of paredrine hydrobromide. Patients 16 years of age and older were given an instillation of one drop of 4-percent homatropine hydrobromide, followed in three minutes by one drop of 1-percent paredrine hydrobromide. A second drop of the paredrine solution was instilled when desired.

The results were compared with those obtained by the usual repeated instillations of 1-percent atropine sulphate alone in the younger patients, and those obtained after repeated instillations of 2-percent homatropine-hydrobromide solution in the older group. Both methods were employed in every patient, and the results were the same regardless of which method was used first. However, in all cases in which the first examination was made with atropine alone, the second test was not made until after fully two weeks had elapsed. When the first test was made after the repeated instillation of homatropine alone, the second examination was made after at least one week, and in some cases after 10 days, had elapsed.

If, for any reason, it was necessary to question the thoroughness of the instillations of either the atropine or homatropine alone, the procedure was repeated in order to insure adequacy in this respect. All instillations by the atropine-paredrine and homatropine-paredrine methods were made by the writer himself, and in a few cases by a careful assistant, and then also under the writer's personal observation. Since only one drop of the paredrine solution was instilled, it was essential that this be carefully administered to the eye in order that the effect might be obtained. Beach also called attention to this point in the use of benzedrine, and emphasized the fact that the drop may be easily lost if proper care is not exercised in the instillation. In any event, however, there is no objection to the instillation of a second drop of paredrine to insure the desired effect. In all cases where atropine sulphate was administered, it was employed in a strength of 1 percent. When the homatropine was used alone in the conventional way, the solution employed was 2-percent homatropine hydrobromide. When used with paredrine, a 5-percent solution of homatropine was employed first. After satisfactory results were obtained with this, weaker solutions were tested. When a 4-percent solution was employed, the results obtained were equal to those of the stronger solution. With a 2-percent solution, the results were in most instances questionable, but when two drops of the 2-percent solution were instilled, the results obtained were more satisfactory. The best results, however, are obtained with either a 4-percent or 5-percent solution.

After the instillation in each eye of one drop of 1-percent atropine sulphate in the younger patients, and one drop of 4-percent solution homatropine hydrobromide in the older group, three or four minutes were permitted to elapse before the instillation of one drop of the 1-percent solution of paredrine hydrobromide was made. In some cases, a second drop of the paredrine was instilled.

Results

The present report describes the results of the use of paredrine with atropine and with homatropine, in a series of patients of all ages ranging from 6 years to 45. The effects were noted with reference: (1) to the size of the pupil after the instillation of paredrine alone; (2) to the presence or absence of any signs of irritation of the eyes after the instillation of paredrine alone; (3) to the intraocular tension; (4) to the production of cycloplegia when employed with one drop of either atropine or homatropine.

The effect on the pupil. The preparation employed was a 1-percent aqueous solution of paredrine hydrobromide, which was obtained from the Smith, Klein, French Company in Philadelphia. In 50 eyes which showed no sign of any previous inflammation, and in which the reaction of the pupils was normal, the instillation of one drop of a 1-percent solution of paredrine produced a dilatation of the pupil to 6 mm. in 40 minutes. The maximum effect was noted in 50 to 60 minutes. At this stage, a faint blurring of the distance vision was noted in most instances, and also a very slight interference with reading J. No. 1 type at the near point. The latter effect was noticeable in a few of the older patients who were close to the presbyopic age. In the younger group it was practically absent. The effect on the pupil was found to wear off with its return to normal size in about 4 to 5 hours.

In no case was any sign of irritation of the eyes noted after the instillation of the paredrine solution alone, and in no instance was any effect on the nasal passages noted.

Effect on intraocular tension. In 25 patients (50 eyes), the intraocular tension was tested with the Schiötz tonometer, before and also 45 to 60 minutes after the instillation of one or two drops of the paredrine solution. No increase in the tension was noted in any. Six of these patients were between the ages of 35 and 45 years, and five patients were above 45 years of age.

The cycloplegic effect. To determine the cycloplegic effect of paredrine the refraction of 130 patients was tested as follows: 40 patients between the ages of 6 and 15 years were refracted under atropine and paredrine. For 75 patients between the ages of 16 and 35 years, and for 15 patients between the ages of 35 and 45 years, homatropine and paredrine were employed. Among the latter group four patients were between 43 and 45 years of age.

The patients were selected in most instances for their ability to coöperate in the subjective and objective examinations, and especial attention was given to the testing of the near points. Each patient was carefully instructed in this regard, so that the purpose was clearly understood. Many patients have a tendency to wait until the test object is moved well within their near point before they state that it is no longer clear. In order to be absolutely certain as to this, they are apt to wait too long before answering, thereby causing an inaccuracy in the result. No less than three readings at the near point were taken in each eye tested.

The cycloplegic effect was obtained in about 45 minutes. The maximum effect was present in 60 minutes. In all cases the visual acuity for distance was recorded and compared in both methods. The near vision and accommodation were measured before and after the instillations in the two methods. A Prince rule and Jaeger test type No. 1 were employed for this purpose. A +3.00 D. sph. was added to the distance correction at 33 cm. with eyes under the cycloplegic. Since most of the patients tested were between the ages of 15 and 40 years, it was possible to determine with reasonable accuracy that the amount of the cycloplegia obtained was equal to that resulting from the use of either atropine or homatropine alone.

In one instance in a patient age 9 years, a P.P. of 28 cm. was obtained. In two patients, aged 10 and 12 years, a P.P. of 30 cm. was obtained in each. In one patient aged 11 years, a P.P. of 31 cm. was obtained, and in another, aged 14 years, the P.P. was 32 cm. The greatest amount, therefore, of residual accommodation with atropine and paredrine revealed, was

equal to about 0.6 D., which was found in one instance. In five eyes, an average of about 0.3 D. of residual accommodation was found.

In the older group, 68 patients revealed a P.P. of 33 cm. after homatropine and paredrine, when a +3.00 D. sph. was added to the distance correction. This compared accurately with the results obtained in the same patients under homatropine alone. In one patient, aged 16 years, the P.P. in one eye was at 29 cm. and in the other eye at 31 cm. In another patient of the same age, the P.P. in one eye was at 32 cm. and at 30 cm. in the other. In a third patient, aged 17 years, the P.P. was at 32 cm. in each eye. In a patient, aged 23 years, the P.P. for one eye was 31 cm. and 32 cm. for the other. In one patient, aged 27 years, the P.P. for one eye was at 30 cm. and for the other at 32 cm. In one patient, aged 32 years, the P.P. was at 31 cm. for each eye. In one patient, aged 26 years, the P.P. was at 33 cm. for one eye and at 34 cm. for the other. The greatest amount of residual accommodation under homatropine and paredrine was therefore less than 0.5 D., and this occurred in one instance. The average residual accommodation in the seven cases (14 eyes) was less than 0.2 D.

Examination by retinoscopy and subjective tests with the trial case showed almost unvarying results from those obtained by the usual method. In two patients aged 6 and 9 years, respectively, a hyperopia of 0.5 D. less by atropine and paredrine was revealed than that obtained when atropine was used alone; however, in another, aged 12 years, 0.25 D. more of hyperopia was revealed with atropine and paredrine than with atropine alone.

With homatropine and paredrine, the results obtained differed only in a few instances from those obtained with the repeated instillations of homatropine alone, and then only to the extent of 0.25 D.

The amount of astigmatism and the axis of cylinders could be determined with equal accuracy, and the results by the two methods were alike in all kinds and degrees of refractive errors. The cases included those with hyperopia up to 9.00 D., as well as cases of myopia and of mixed astigmatism of all degrees.

The cycloplegic effect from homatropine and paredrine begins to wear off in from 4 to 5 hours, and news print can be read in about 8 hours. Black glasses can usually be discarded on the following morning. All near work can be accomplished without difficulty, and the patient can resume the normal use of the eyes within 18 hours. After instillations of atropine and paredrine, the power of accommodation returns in from two to three days. Four days was the longest time during which the effect of the cycloplegia was found to be present in these cases.

Conclusion

Cycloplegia was obtained in patients below the age of 16 years by the instillation of one drop of a 1-percent solution atropine sulphate, which was followed in about three minutes by the instillation of one drop of a 1-percent aqueous solution of paredrine hydrobromide. In patients 16 years of age and over, one drop of 4-percent homatropine hydrobromide was employed, followed in three minutes by one drop of a 1-percent solution of paredrine hydrobromide. A second drop of the paredrine solution was instilled when desired. In both groups of cases the maximum cycloplegic effect was produced in 60 minutes.

No increase in the intraocular tension was observed in any of the patients tested.

No sign of irritation of the eyes nor of the nasal mucous membrane was noted in any.

The age of the patient and the kind or

extent of the refractive error in no way affected the results obtained. These results compared uniformly with those obtained in the same patients after the usual repeated instillations of either atropine or homatropine.

This method also offers the added advantage of a rapid recovery from the effects of cycloplegia, since with homatropine and paredrine the patient can resume the normal use of the eyes on the following morning. With atropine and paredrine, the normal use of the eyes can be resumed in about three days, as compared with at least 10 days by the usual method.

This method can be employed with satisfactory results in office practice especially, and will greatly reduce the time lost to the patient, thereby also eliminating an objectionable feature of the present method of inducing cycloplegia.

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AN EVALUATION OF VISUAL-TESTING METHODS IN SCHOOLS

Preliminary report

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This study was undertaken because of a considerable number of inquiries on the part of educators and physicians in regard to the proper or best methods of testing school-children's vision, and because of rather definite disagreements between ophthalmic physicians as to how detailed a visual test should be used in the schools.

It is assumed at the outset that a "screening" test for visual efficiency in schools should have certain attributes. It should pick up the majority of visual deficiencies without including minor transitory visual disturbances, functional or psychological in origin; it should be quick and easy to operate without the need for special training or technical knowledge.

This paper is in the nature of a preliminary report, comparing a small series of subjects tested with the Snellen chart, the stereoscopic method of Betts, and by a thorough ophthalmological examination. The group comprised 32 children, ranging in age from 6 to 14 years, all of whom were referred to the ophthalmological department of the Milwaukee Children's Hospital; hence they do not represent a cross section of average school children.

All children in this series had received a retinoscopic refraction under either atropine or homatropine cycloplegia by the cylindrical method of Lindner. The refractions were all tested by the author within six months preceding the time of examination. The cases were unselected except that those of obvious ocular disease and manifest strabismus were eliminated.

The standard Snellen chart at six meters was used with uniform artificial

illumination. The intensity of the light was not measured. The Betts tests were administered as recommended in Betts's textbook on remedial reading. This test was immediately followed by what we shall term an ophthalmic test consisting of a Snellen test for distance as above, and a muscle-balance test at six meters and at 33 cm., using the Duane screen prism test and the Maddox rod. As far as possible the average of the two was recorded. Fusion tests employed were the Worth four-dot test at six meters and 33 cm., at six meters the dots subtending an angle of 12 minutes and the distance between dots subtending an angle of 21 minutes; the four-dot at 33 cm., subtending an angle of 51 minutes, the distance between dots an angle of 177 minutes.

Depth perception was tested on the Howard-Dolman apparatus, the operator setting the instrument according to mathematical chance (twenty cards shuffled before each test) correct answers in 8 out of 10 tests at a given separation of the pegs being considered as the correct determination. No subjective tests for astigmatism were attempted.

Results

A total of 48 tests was made on 32 patients, tests being made both with and without glasses.

A comparison of the Snellen test alone (with 20/30 vision or better being taken as normal) with the Betts test and thorough ophthalmic test revealed that in 48 examinations with the Snellen test visual defects were revealed in 24 (50 percent). With the Betts test defects were found in 43 (89 percent). By the ophthalmic test defects were present in 33 (69 percent).

Analyzing the individual tests of the stereometric and the ophthalmic groups, we find in the comparison of visual acuity a total of 96 tests (two eyes, 48 examinations). In 74 tests (77 percent) the two tests agreed (that is, the figures agreed within 20 percent, using the industrial percentage of visual-loss tables published in Berens's textbook on ophthalmology). In 22 cases (23 percent of total) there was a disagreement, and of this group in 15 tests (66 percent), the Betts test disclosed the greater deviation from normal; in seven tests (33 percent) the ophthalmic uncovered a greater error.

This discrepancy in figures is explainable on two counts: first, using the dot test higher astigmatic errors are not picked up; second, the stereoscopic test allows suppression to occur which is not possible in the ophthalmic tests.

In the muscle-balance tests (that is, the average of the screen prism tests and Maddox rod) an esophoria or exophoria at 6 meters of 4 diopters was considered abnormal, an esophoria of 4 diopters or an exophoria of 6 diopters was considered abnormal at 33 cm.

Out of 96 tests (48 examinations for both 6 meters and 33 cm.), in 81 (84 percent) the Betts and ophthalmic tests agreed. In 15 tests (16 percent) there was disagreement, and of these the Betts tests disclosed a greater deviation from normal in 3 (19 percent), the ophthalmic in 12 (81 percent).

The discrepancies here can be accounted for, first, because the standards set in both tests were purely arbitrary, and, second, because there is admittedly a psychic convergence stimulus in the use of the stereoscope as a test for muscle balance.

The visual angles subtended by the fusion tests (Worth four-dot at 6 meters and 33 cm.) in the ophthalmic group were given previously, 12 minutes at 6 meters, 51 minutes at 33 cm.; the angle subtended by the Betts tests is 17 minutes, both distance and near being the same, the only difference being the amount of accommodation and convergence employed.

In 96 fusion tests (48 examinations for distance and near) the Betts and ophthalmic agreed in 49 (51 percent), disagreed in 47 (49 percent). Among those which disagreed the Betts tests showed a greater deviation from normal in 40 tests (85 percent) the ophthalmic in 7 tests (15 percent). At least one cause of the discrepancy in these figures is obvious; namely, the difference in the visual angles subtended by the various tests. And again the psychic convergence of the stereoscope probably is a factor.

The comparison of depth perception or stereopsis is a somewhat difficult problem inasmuch as accommodation and convergence play a much larger rôle in the measurement on the stereoscope than in the Howard-Dolman apparatus. Mathematically the comparison can be made by measurement of the parallactic angle. With the Howard-Dolman apparatus a depth perception of 25 mm. at 6 meters subtends a parallactic angle of 10.4 seconds, depth perception of 150 mm. subtends an angle of 56 seconds. Comparatively the Betts stereopsis slides subtend angles varying from 140 seconds to 1,300 seconds. With this large difference in the mathematical comparisons, even allowing a large percentage of error for the factors of psychic accommodation and convergence, one can safely assume that anyone showing a depth perception of 50 mm. or under on the Howard-Dolman apparatus should show close to 100-percent stereopsis on the Betts test and, conversely, any subject showing near 100 percent with the Betts test might logically show no depth on the Howard-Dolman. Taking this basis for comparison we find agreement of the tests in 34 (72 percent) of 47 tests. In 13 tests (28 percent) the Betts tests showed 70-percent stereopsis or better, while the Howard-Dolman, a much more accurate test mathematically, showed a depth-difference perception of better than 50 mm. at 6 meters. In commenting on the discrepancy in these two tests one can only say that depth perception under natural conditions as with the Howard-Dolman apparatus, assuming, of course, a nearly normal visual apparatus, is an easy automatic psychic act, while many persons have difficulty and must make a conscious effort to obtain stereopsis on an instrument such as the stereoscope.

In attempting to compare the Betts sharpness-of-image tests with a test used in average ophthalmic practice the only tests available are the astigmatic dials. These tests seemed to us to be impractical of application in a series of young children. The Betts tests were therefore compared to an arbitrarily selected standard of refractive error found on retinoscopy under cycloplegia. The limits of normal refraction were taken as minus 25 D., plus 1.00 D., and one-half diopter astigmatic error.

On this basis the Betts and refractive tests agreed in 25 (78 percent) of the 32 subjects with uncorrected vision and disagreed in 7 (22 percent). Of these seven tests, Betts showed the greater deflection from normal in four, the refraction in three. In the 16 corrected with glasses there was agreement of the tests in 9 (56 percent) and disagreement in 7 (44 percent). In other words, in the cases of uncorrected vision there was a 22-percent discrepancy in findings comparing the Betts astigmatic test with an arbitrary amount of refractive error. However, when that error was fully corrected to the best of the author's ability with accepted methods of refraction there remained 44 percent of the subjects with corrected vision who still showed errors with the Betts test.

Discussion

In discussing methods of testing school children's eyes one can easily get into a controversy on how high a standard

should be set, this then quickly leads to a discussion of whether the average children's eyes are deficient, or whether the educational requirements today are too great for the physical (ocular) equipment with which nature has endowed us.

Therefore let us set forth a few postulates which would seem to be fair criteria of a screening test to be used in the schools for the selection of those who should be referred to an ophthalmologist for examination, because of defective vision. (1) As stated earlier any such test should pick up most errors without finding minor transient psychic effects. (2) The test should be easy to operate. (3) The test should not be more discriminating than the accepted thorough examinations utilized by the majority of competent well-trained ophthalmic physicians. (4) If the principles on which the test is based are different from those accepted by competent ophthalmologists then at least the findings must agree fairly accurately with the findings of a thorough ophthalmic test.

The Snellen chart alone, having missed a considerable number of errors recorded by both the Betts and the ophthalmic tests, would be eliminated by the first postulate.

Ease of operation would eliminate any such complete test as described as the ophthalmic test in this paper.

The Betts tests immediately open themselves to criticism as being too discriminating, since they picked up errors in 89 percent of cases as against 69 percent in the ophthalmic test. Further, in analyzing the individual tests of the Betts series, one finds that in the visual-acuity tests, the fusion tests, the depth-perception tests, and the sharpness-of-image tests, the Betts series was definitely more discriminating, and that in the muscle-balance tests alone the ophthalmic test disclosed a greater deviation from normal. In fairness to the manufacturers it must be stated that they ask that the test be accepted as a whole, not separated into its component parts. This request does not appear to me to be reasonable, since the whole test is made up of its component parts and errors creeping into the individual test must influence the accuracy of the test as a whole.

Finally the question arises as to whether the findings of the Betts test agree (inasmuch as the principle of the stereoscope is brought into the picture) essentially with more or less standard accepted ophthalmic tests. In the visual-acuity tests there is a discrepancy of 23 percent, in the muscle-balance tests a difference of 16 percent, in the fusion tests a difference of 49 percent, in the depth-perception tests 28 percent, and in the sharpness-of-image tests compared to refractive errors, 22 percent.

Conclusions

1. This paper is to be regarded as a preliminary report and definite conclusions from such a small series of cases admittedly not average school children must be drawn with great caution. It would appear that on the basis of this study the Snellen chart alone is inadequate as a test for school children's visual efficiency.

2. That the Betts tests in their present state of development pick up errors that are transitory or do not exist in the normal use of the eyes.

3. That the thorough opthalmic test is impractical and that the ideal may be to add to the Snellen test a simple test of fusion and muscle balance which could be operated by the teacher or school nurse.

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NOTES, CASES, INSTRUMENTS

SPONTANEOUS EXTRUSION OF AN INTRAOCULAR FOREIGN BODY (SHOT) WITH RECOVERY OF VISION

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Called into consultation on November 29, 1935, the writer found that the patient, F. W., 27 years old, had suffered a gunshot wound (no. 6 bird shot) of both eyes and face at short range, about 18 feet, while on a hunting expedition. The roentgenogram showed about 150 shot in the forehead and face, three in the left eye, and one in the right. The patient was under the care of Dr. Larsen at the Morris (Illinois) Hospital.

A severe iridocyclitis developed in the left eye, causing great pain. This eye was therefore enucleated on December 6, 1935, 16 days after the injury.

The patient had light perception in the right eye. Atropine was continued in this eye and foreign-protein injections were given. Absorption of blood and cataractous lens progressed slowly. On February 1, 1936, two months and 10 days after the injury, Dr. Larson discovered the shot underneath the bulbar conjunctiva, on the temporal side, about 5 mm. behind the limbus and about in the horizontal plane. This was removed through a slit in the conjunctiva.

Lens absorption continued, so that the patient began to see sufficiently to get about, and on February 1st he could count fingers on the temporal side. On October 7, 1936, a capsulotomy was performed with the de Wecker scissors through a keratome incision. This method was chosen as being less likely to excite inflammation or retinal detachment as compared with the use of any form of knife needle with consequent traction on the uvea.

At the present time the patient can read 20/20 with correction, and the finest print.

The fortunate outcome in this case is due to the fact that the shot did not injure the ciliary body either at the point of entrance in front of, or at the point of partial exit behind, the ciliary processes. The sclera must have been partly penetrated, otherwise the shot could not have made a spontaneous exit two months subsequent to its entry.

This is the only case in the experience of the writer in which shot was spontaneously extruded from the eyeball; many cases, however, have been reported of extrusion of glass and metals many years after the accident.

The importance of accurate localization should be stressed. If the individual has but one eye and that injured with shot, X-ray localization by two different operators would be justifiable. Errors in localization are not uncommon. Many cases have been recorded of removal of shot from the eyeball with preservation of the globe but loss of vision. One, recorded by Dr. Cross of Chester, Pennsylvania, reports preservation of normal vision after removal of shot with his special forceps under fluoroscopic control. A recent communication from him states that normal vision was preserved up to the last observation, six years after the accident.

In a recent issue of the American Journal of Ophthalmology Borley and Leef of San Francisco report a case in which the Cross method was successfully used; but subsequent vision was limited to light perception. In this article reference is made to the ocular endoscope of Thorpe

of Pittsburgh. It is readily obvious that both of these methods involve the further traumatism of the uvea and vitreous. This may be justifiable in certain cases, but in the case here reported could not have produced the results that the waiting policy achieved. Accurate localization was not possible in this case, for the patient had no power of fixation.

MACULO-CEREBRAL DEGENERATION

DAVID NATHAN, M.D.

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This condition is distinguished by various names: progressive familial macular degeneration, tapeto-retinal degeneration, heredo-macular degeneration,[1] macular pigmentary retinosis, Stargardt's disease,[2] and others. Classical examples of this disease, which I here report, were passed on to me from a State Hospital for the Insane, as possible cases of the Laurence-Biedl syndrome. The numerous names manifest the work of a host of observers, each one designating the condition by the term he thought best suited his clinical findings. Troncoso[3] gives to C. Behr[4] the credit of having brought together these various macular changes under the general heading of hereditary diseases.

The condition, with age as the criterion, has been divided into five groups:[2] congenital (occurring at birth), infantile (beginning between the sixth and eighth years), juvenile puberty (fourteenth to twentieth years), adult (senile involutional period, over 50 years), and the senile type beginning in old age.

The ophthalmoscope does not reveal a sharply defined picture specific for any one of the foregoing types, but there is much similarity in the fundus appearance in members of the same family suffering with the disease. Both eyes are affected, in nearly all cases at the same time; the condition appears at about the same age in different members of the same family, and there is the familial character of the affection (transmission being most frequent through the infected female). Consanguinity is common.

Behr[4] states that the condition is due to a defective embryonic development of the nerve cells of the macula (abiosis). Collins[5] states "generally when the neuro-epithelium at the macula is the first part to degenerate, the peripheral parts do not become involved, the central vision having been destroyed, no further loss occurs." Lloyd[6] says that Treacher Collins has been the only one to make a microscopic examination of the retina in heredo-macular degeneration. Collins[5] found the elastic layer of the choroid very much thickened by hyaline changes; there were nodes here and there which threw back the light of the ophthalmoscope to give the impression of the soft, round, white spots. The changes in the lamina vitrea take place behind the retina, and exist for a long time without seriously affecting the function of the pigment layer or the rods and cones, and do not interfere with light rays impressing them.

The following cases are the result of a consanguineous union, the parents being first cousins. The father's aunt and his sister suffered with what was apparently the same condition. The patients' immediate family consisted of twelve children—four of these died in early life, the oldest of these latter dying at the age of one year and being blind; the particulars relative to the cause of death of the others is not known. There are eight living brothers and sisters, all of whom, but one, were born in Russia. Of the living siblings, there is one, now a woman, who

is said to have undergone a needling operation in childhood (congenital cataract?) from which she has fully recovered; there is another, a man in the thirties, almost blind and feebleminded. Four are married, three of these have children; the children of two of them are healthy; the other, a man, is the father of two or three children who are afflicted with what bespeaks a like condition. There has been no consanguinity in any of the siblings' marriages.

Case reports

In the first patient there had been a defect of vision from the earliest childhood, probably infancy; the loss of vision progressed insidiously down the years until the present, when there is little but light perception. There had been no other illnesses of moment. N. M., a Russian Hebrew, aged 36 years, eighth child in line of birth, a short, somewhat heavy-set man, with steady gait—no ataxia—no Rombergism—evinced no muscular weakness, wasting, hypertonicity nor spasticity. All reflexes were active, there were no pathological reflexes, no objective sensory disturbance, no sign of cerebellar disorder, no cranial-nerve palsies. The pupils were equal, 5 mm. in diameter, regular in outline, and active to light.

Dr. Walter I. Lillie reported the fundus examination as follows: "The discs were quite pale and the arteries contracted; in the macular region of each eye was a large area of choroidal degeneration, with considerable pigment clumping and some pigmentation well outside the macular region and extending toward each disc. The visual fields showed a rather marked concentric contraction to light and, of course, if the fields could be plotted, a definite ceco-central scotoma would be present bilaterally. His vision has deteriorated to not much better than light perception."

X-ray examination of the skull showed no sign of increased intracranial pressure; the sella turcica was normal. Genitalia and hair growth and distribution were normal. There was no syndactylia nor polydactylia. The basal metabolism was normal, the blood presure 122/88, the blood count normal. Blood chemistry: sugar 100 mg., urea nitrogen 20 mg., creatinine 1.57 mg. Blood serological: Kahn and Kolmer negative; spinal fluid: Kahn and Kolmer negative, Mastic negative.

Mental status: an intellectually dull man whose poverty of ideation was manifold; he answered questions and obeyed simple commands, was distractible and slow in thinking, expressed no hallucinations nor delusions, was easily comforted and seemed to be emotionally balanced. He had insight, a fair memory, and judgment comparable to his low-grade intelligence. According to the Stanford-Binet test, the chronological age was 26 years, the mental age, 6 years. Classification: Imbecile. Diagnosis: Mental deficiency without psychosis.

The second patient stated that she had had trouble with her eyes following an attack of pneumonia, some four or five years ago; this, however, is not the case for she is said to have suffered with poor eyesight since she was a very young child. There have been no other serious illnesses. Both she and her brother described above, were full-term children and delivered without instruments: fifth in line of birth. A somewhat obese woman, aged 26 years, with steady gait showed no Rombergism; there was no muscular weakness, wasting, hypertonicity, nor spasticity. All reflexes were active, there were no pathological reflexes. There was no objective sensory disturbance, nor evidence of cerebellar dysfunction. There were no cranial-nerve palsies. The pupils were equal, regular in outline,

4 mm. in diameter, and reacted sluggishly to light.

Dr. Walter I. Lillie reported the fundus as follows: "There was a slight pallor of the discs, the physiologic cups were normal in size, the retinal arterioles were somewhat contracted but with regular lumen. In the macular region in each eye, there was a large area of pigment degeneration with irregular borders and with pigment clumps varying in size and color. Both eyes were about equally affected. The visual fields, roughly, showed a moderate concentric contraction to form, with a definite large ceco-central scotoma."

X-ray examination of the skull showed no sign of increased intracranial pressure; the sella turcica was normal. Genitalia and hair growth and distribution were normal. There was no syndactylism nor polydactylism. Blood and spinal-fluid serology was negative. Blood chemistry and other tests were essentially the same as those described in the first case.

Mental status: An intellectually dull woman orientated as to persons and place, obeyed commands, had a good memory, was well behaved and appeared contented; emotionally stable. Stanford-Binet test, chronological age 23 years, the mental age 10 years; I.Q. 64, calculated on a 15-year basis. Diagnosis: High-grade mental defective without psychosis.

Summary and Comment

There are relatively few cases of this type of retinal degeneration that are found in the literature.

Much difficulty was encountered in obtaining a family history, meager as it is, so that it is useless to discuss the inheritance, whether direct (Mendelian unit character) or, recessive; but that there is the hereditary factor, is not easily gainsaid.

The ophthalmoscopic picture suggests a degenerative pathological process rather than an inflammatory one.

The mental changes can be accounted for in part by the early deprivation of vision, along with degeneration of neuronic elements—probably abiotrophic.

This condition, lacking the clinical signs found in Tay-Sachs idiocy[7] or the forms described by Spiel-Vogt and Jansky* and Bielschowsky,* makes the nature of the cerebral changes conjectural.

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* See reference 7.

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SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

ROYAL SOCIETY OF MEDICINE, LONDON

Section on ophthalmology
October 8, 1937

Mr. W. H. McMullen, *president*

Defective movement of left eye

Major J. Biggam presented a youth of 18 years, who had been training at the Army technical school as a bricklayer, and who was quite fit until he fell ill one night. He vomited three or four times, and, in case it should be wanted, a bucket was placed at his bedside. This he struck in the night with his left eye, and a bruise resulted. In the morning when he awoke he still felt unwell and had diplopia. The latter however, improved slightly for a month or so. All forms of investigation gave a completely negative result, and the Wassermann and the neurological investigations were negative. As there was a liability of a fall from a scaffold, and injury to himself or others, he was invalided out. In reading a book he tilts his head backwards; has limited binocular vision. He is now in full civilian work. The opinion of Dr. Gordon Holmes was asked, who wrote that the fact that this man's upward and downward movements are involved, rather than individual muscles, suggested that there is a supranuclear lesion. Dr. Holmes advised carrying out the Roth-Bielschowsky reaction. According to this test, if such a lesion exists the eye moves from the position of rest when it is fixated on any object, and the head moves in the opposite direction. The patient should be asked to look directly at the examiner's face and then slowly flex his head downwards. If the lesion is supranuclear, the left eye will move outwards.

Lenticonus posticus

Mr. T. Harrison Butler spoke on this subject and demonstrated a number of photographs and drawings in illustration. He said that lenticonus posticus has been confused with myopic degeneration of the lens, due to the fact that the lens is composed of a concentroid of nuclei which have a gradually increasing curvature. There might be a senile sclerosis of the center of the lens unassociated with any alteration of the index of refraction, without increase of myopia or any development of myopia where there had been none. Now and then, however, a case associated with changed refractive index is encountered. If different parts of the lens have a higher index of refraction, rays passing through such parts come to a focus closer to the lens than those which pass through the periphery, resulting in a linear focus. Sometimes one is puzzled by patients declaring that everything looked at appears watery, yet examination by ordinary methods reveals nothing amiss. In such cases, though the vision might be 6/4 by test-types, a retrobulbar lesion should be suspected. Or it might be one of the conditions in the lens which sometimes may be elucidated by the use of the slitlamp. In these cases the myopia might increase very rapidly.

Lenticonus posticus is an uncommon condition, perhaps 1 in 10,000 cases. On looking into the lens with the slitlamp there is seen what looks like an oil glob-

ule, and on flashing the light around a crater appearance is observed. There also is a condition known as lenticonus posticus internus.

A condition which it is necessary to distinguish from the foregoing is glass-blowers' or puddlers' cataract. The illustrations presented showed exfoliation of the zonular lamella of the anterior cataract. The slitlamp showed at once what had happened. The zonular lamella was the outermost part of the capsule, and when the lens was dislocated by violence it was dislocated out of the zonular lamella. The latter remained behind, with the filaments of the suspensory ligament attached to it. When one found a posterior central opacity combined with a peeling off of the zonular lamella one could, almost always, say it was the result of infrared irradiation. But Mr. Butler did not think one could go into a court of law and say because the man was a glass-blower, or a puddler, therefore he was suffering from puddlers' cataract; one could say no more than that it was almost certainly so.

He also showed pictures of radium cataract. This might result quite a long time, as much as two years, after the radium applications. The slitlamp showed large vacuoles just under the capsule. A rarefied space could be seen, and a definite secondary lenticonus posticus.

Discussion. Mr. J. Foster said he had seen cases of glass-blowers' cataract in people working at the making of glass bottles. One man with the condition had been working on red-hot blooms by means of a steam-hammer for 20 years. He had only one eye, and this showed desquamation of the capsule, a curling up of the lamellar layer. A peculiarity of the law was that in this injury compensation could only be paid if the operation had been performed within six months of the accident.

Dr. A. J. Ballantyne (Glasgow), referring to the changes due to myopia, said he had a woman patient who had been wearing —13 D. sph. lenses because of myopia with condensation of the nucleus of the lens. She was so discontented with her lens that she had extraction carried out by another medical man, but as she now had to wear +13 diopter lenses, the contrast was so great that she never became reconciled to it.

Mr. Basil Graves said that optical section of the type of sclerosed nucleus referred to by Mr. Harrison Butler revealed a feature which gave added interest in conjunction with Fincham's recent monograph in last year's British Journal of Ophthalmology on "The mechanism of accommodation." The article pointed out certain characteristics relating to the shape, in accommodation, of the anterior capsule, whose curvature was complicated by a shortening of the radius of the central portion. The anterior face showed this same type of curvature, while the posterior face had a relatively uniform curvature. This provided an interesting subject for speculation.

(Reported by H. Dickinson.)

SAINT LOUIS OPHTHALMIC SOCIETY

October 29, 1937

DR. LAWRENCE T. POST, *president*

TRANSILLUMINATOR AND CLAMP FOR LOCATING TEARS IN THE DETACHED RETINA

DR. H. NOLAND FISHER read a paper on this subject which will be published in this Journal.

Discussion. Dr. B. Y. Alvis said he had observed the use of this instrument in two cases of operation for detachment of the retina. In one case the cornea was clear and the pupil well dilated. A good

view of the illuminated posterior portion of the retina could be had by looking directly into the pupil. No tear could be found in this case, so the usefulness of the instrument for locating a tear could not be demonstrated. One could see a localized area of illumination of the retina several disc widths across; hence, it would seem possible to place the light approximately over any visible point—as a tear—if one had existed. The illuminated area was rather too large for accurate localization and perhaps a later model would give light to a smaller area. No difficulty was experienced in fixing the instrument to the globe.

In the other case the cornea became clouded and observation was impossible. It would seem that the instrument has possibilities.

COMMUNICATION ON THE USE OF TINTED LENSES

DR. JULIUS H. GROSS said that he had frequent requests by patients for tinted lenses. He believed this was because of the literature and advertising which the manufacturing and dispensing opticians circulate. This literature generates psychical photophobia. A person with normal eyes, under ordinary circumstances, is not inconvenienced by sunlight, and seldom by light used for illumination, unless the latter comes from an unfavorable angle.

He said that it might not be amiss to enumerate briefly the natural anatomical protection of the eyes against strong light. The superciliary ridges and the eyebrows shade the eyes from light which comes from above. The eyelashes, when well developed, act as a screen, and the eyelids, fortified by the dense tissue of the tarsal plates, are very efficient.

It would be unwise to observe an eclipse of the sun unprotected by a smoked glass; however, beyond doubt, many persons do look at the sun during an eclipse, as well as at other times, without injuring their eyes.

Then there are the many industrial occupations, such as electric welding, stoking a furnace, and many others in which the operator is exposed to intense light and should be protected by colored glasses.

The claim which some lens manufacturers make that their slightly tinted lenses do not lessen the acuteness of vision, is certainly not correct. Any tint or pigment in glass diminishes its transparency. Anyone may easily satisfy himself as to that by trial.

Many persons who have worn tinted glasses have learned that after wearing them for a time their eyes are not more comfortable than they were before wearing them; and found it difficult to discard them.

In a lecture delivered in Saint Louis, in 1925, Dr. Edward Jackson said: "The eyes are made for light. It is the tool they work with, the stimulus to which they react, the thing they must continually adjust themselves to. In general, light is too bright only when it comes from the wrong direction and shines on the eyes, instead of on the surface looked at."

The oculist's reasons for prescribing tinted lenses may be: That the patient will be driving over white concrete roads. He may be going to a desert where the rays of the sun are reflected from white sand. He may be on the water, or on a snow field. In all these instances the light would be reflected from below the horizon. A patient may have dilated pupils, either from drugs or paresis of the sphincter pupillae. The patient may have a photophobia due to a lack of vitamin A, and from other causes.

In conclusion: There is no doubt but that optometrists and opticians dispense tinted glasses oftener than necessary; also

that oculists prescribe tinted lenses just because their patients ask for them. In his opinion tinted reading glasses should not be prescribed. He has seen tinted bifocal glasses prescribed for constant use by good oculists. Recently it had been his privilege to relieve a number of patients of their tinted lenses. Some of them felt better without the tint in their glasses; and not one complained, nor regretted the change, after one or two days.

Discussion. Dr. H. Rommel Hildreth said that Polaroid lenses fulfil a certain theoretical need better than mere tinted lenses; in other words, they would remove some unnecessary light, leaving the part required for seeing. As an example, much of the light reflected from the pavement into a driver's eyes is not required for good vision and incidentally happens to be polarized. (Much of the light reflected from a nonmetalic surface becomes polarized by virtue of reflection.) Reducing this excess light from the road surface by tinted lenses is to reduce also all light entering the eye, whereas a Polaroid lens absorbs specifically the excess unneeded light (glare). Actually, the difference in favor of the Polaroid glasses over the tinted lens is very little, for so much of excess light is not polarized. Further, the imperfect surfaces of Polaroid lenses are a disadvantage.

Complete luxation of cataractous lens into anterior chamber; successful removal

Dr. Charles W. Tooker reported the case of J. P. K., aged 66 years, who consulted him on October 10, 1924, because of impaired vision. Vision of the right eye was 10/240, not improved with glasses. Vision of the left eye, with a −2.00 D. sph. was 20/50. Intraocular tension and visual fields were normal. There were immature cataracts in the central pupillary areas and superficial corneal scars of the right eye. On November 14, 1925, he performed a combined extraction of the left cataract and on April 24, 1926, a discission of the thickened posterior lens capsule.

On May 28, 1934, a mild uveitis developed in the right eye, accompanied by an increase of intraocular tension. The patient was under treatment at this time for sinusitis. After the use of atropine and general treatment the uveitis subsided. At this time the cataract in the right eye was mature.

On June 11, 1937, he overlifted, and the right eye became painful. On examination the intraocular tension measured 55 mm. Hg (Schiötz); ciliary injection was well marked. The cataractous lens was seen in the lower portion of the anterior chamber, anterior to a dilated pupil. The use of eserine and hot applications did not reduce the intraocular pressure but caused some reduction in the size of the pupil. Twenty-four hours later the lens was removed by the following operation: The corneal section included two fifths of the circumference of the cornea and was continued under the conjunctiva above, forming a bridge about 4 mm. wide and 10 mm. long. The iris contracted moderately, and without iridectomy the cataractous lens was removed from the anterior chamber. Healing was uneventful.

On October 19, 1937, the intraocular tension of the right eye measured 22 mm. (Schiötz), the field was normal, the vitreous slightly hazy, and the nerve head normal. Vision with +12.00 D. sph. ⊂ +2.00 D. cyl. ax. 75° was 20/50 for distance. The left eye has continued serviceable with good vision, normal field, and normal intraocular tension.

H. Rommel Hildreth,
Editor.

CHICAGO OPHTHALMOLOGICAL SOCIETY

November 15, 1937
DR. THOMAS D. ALLEN, *president*

RECURRENCE OF SARCOMA OF THE CHOROID IN THE FORM OF AN ORBITAL TUMOR, NINE YEARS AFTER ENUCLEATION

DR. MAX HIRSCHFELDER said that his patient (P. S.), a man aged 78 years, was first seen at the Illinois Eye and Ear Infirmary in 1922, at which time his right eye had been inflamed and painful for several months. There was no light perception in the right eye; tension 60 mm. Hg (Schiötz). Diagnosis: absolute glaucoma, incipient cataract, and detachment of the retina. Trephining of this eye was postponed because the culture was not sterile, and it was finally decided to let the eye alone.

In 1928 the eye became inflamed and painful and was enucleated. Dr. Theobald's histologic examination showed sarcoma of the choroid with extrabulbar extension to the nasal side, many areas of degeneration of tumor tissue, atrophy of all intraocular tissue, and scarring of the cornea. Neither roentgenotherapy nor radium was given following enucleation.

When the patient returned in 1937, he stated that he had never been able to use his prothesis, and that he had noted a new swelling in the orbit, with intermittent pain, about two years prior to this time. There was a protruding tumor of the right orbit which infiltrated the upper lid. The tumor was not sharply limited, was very hard, and had not broken through the skin. No enlargement of any regional glands nor metastasis of the orbital bones or other parts of the body was found. The right orbit was exenterated in July, 1937. There was a suspicion that the tumor had broken through into the right antrum. Healing was uneventful. After-treatment with radium was given at Michael Reese Hospital.

Histologic examination of the tumor showed sarcomatous tissue of the same type found in the enucleated eye nine years previously. One week ago a new nodule was found in the lower nasal side of the orbital skin.

This case is presented because of the slow progress of the disease. Had the eye been enucleated in 1922 there might have been no recurrence.

PAPILLEDEMA—ALBUMINURIC RETINITIS

DR. MAX HIRSCHFELDER said that this man (P. K.), aged 52 years, gave a history of poor vision with esotropia in the left eye, which had been corrected thirty-five years previously. About one year ago, he noted a spot in front of the left eye which diminished the vision further. The right eye had always had good vision until a week prior to admission to the Infirmary, in September, 1937. There was no pain, but vision seemed to be diminished. He had had headaches for about two weeks, but no neurologic symptoms were found at the time of admission. One year ago, he stated, there was a disturbance of the right cheek, with twitching of the right corner of the mouth and ptosis of the right upper lid. These symptoms disappeared after two months. The blood pressure was said to have been 260.

On examination, corrected vision was R.E. 20/25; L.E. the ability to count fingers at three feet from the temporal side, hand movements only on the nasal side. Pupillary reactions were lessened in the left eye. There was an esotropia of five degrees and hypertropia of two or three degrees in the left eye in the primary position; in the secondary position the left eye was slightly higher than the

right. In the right eye an underaction or slight paresis of the inferior oblique was noted, and an overaction of the superior oblique. In the left eye the superior rectus, the superior oblique, and the inferior oblique were found to overact. As to fields, the right eye showed an absolute scotoma of the peripheral lower nasal projection field, but no central scotoma; the left eye an absolute scotoma in the lower nasal and partly in the lower temporal periphery.

The fundus of the right eye showed edema of the disc with an elevation of two to three diopters and a small hemorrhage. The disc of the left eye was somewhat pale and slightly blurred, the arteries were very small, and there was an indentation of the veins by the arteries in both fundi. The choking of the right disc increased slightly during the patient's stay in the hospital.

General physical examination showed a blood pressure of 190/110; there was a systolic murmur, and albuminuria of one plus. Blood Wassermann test and blood chemistry were normal.

Tentative diagnosis: papilledema of the right eye, secondary optic atrophy of the left eye, with scotomata in the lower fields of both eyes. Differential diagnosis: tumor cerebri of the frontal lobe, on the basis of a Foster Kennedy syndrome. The sense of smell was not impaired, however. The neurologist disagreed as to the secondary optic atrophy in the left eye, and diagnosed an aneurysm of the right carotid artery in the skull.

At this time, five weeks later, the edema is much improved and the right disc is less elevated. Some pallor is evident. A new finding, an albuminuric retinitis is present in the left eye. The case shows that eye findings in kidney disease may be similar, in the beginning, to those of a tumor cerebri.

Cyanosis retinae

Dr. Theodore M. Shapira read a paper on this subject which was published in this Journal (July, 1938).

A method of flicker perimetry

Dr. Leo L. Mayer, and (by invitation) Irving C. Sherman presented a paper on this subject which was published in this Journal (April, 1938).

Discussion. Dr. Leo L. Mayer (closing) said, in reply to Dr. Rainey, that this test had been made in cases of multiple sclerosis with a scotoma near the macula. A marked difference was found in the fusion at this point. What that meant he could not say.

In answer to Dr. Allen he said this method was much more rapid, using the single oscillation. It was thought that the difference in the appreciation of varying oscillation made the method of value and only when there was an oscillation over a distant range of 20, 30, or 45 per second, did it become of any value in taking fields of vision. The method had not been used in lens opacities.

Foreign body (steel .84 gm.) removed from vitreous: vision 20/25 seven years later

Dr. Clarence Rainey read a paper on this subject which was published in this Journal (July, 1938).

Discussion. Dr. Thomas D. Allen said that during the war, two men came on the same day to the clinic at general headquarters, each with a large foreign body in the eye; one a bullet; the other, a piece of shrapnel. Both eyes were lost, of course. He had seen Dr. Rainey's case and his own records confirmed everything Dr. Rainey had said. The fields confirmed even the notching shown in his pictures. Dr. Allen considered it remarkable that a

retinal detachment of this size should return to normal without operative procedure. Von Szily showed a case of detachment of the retina with a diagram of the hole. The patient was put to bed and after a week or so the detachment subsided. After three weeks he was sent home. He came back eight months later with another detachment and retinal tear in another part of the retina.

Robert von der Heydt

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

November 18, 1937
Dr. Charles R. Heed, *chairman*

Choroideremia

Dr. Henry O. Sloane stated that choroideremia is a rare condition of the eye. Bedell (Archives of Ophthalmology, 1937) reported on 26 cases in the literature and added five cases of his own. Dr. W. I. Lillie reported an additional case, making a total of 32 cases thus far. The condition may be congenital as in many of the cases reported; one or two members or relatives have been involved. Pathology occurs, however, during the life of the patient. It usually affects males. In the cases reported, the age varied from 5 to 76 years. Most of the patients had myopia. The characteristic change is the disappearance of the choroidal tissue. First the smaller vessels disappear, then the larger ones become very narrow and finally melt away (Bedell). The pigment of the fundus is partially or completely dissolved. The sclera becomes visible, giving a white reflex. This is associated with hemeralopia. The field of vision shows early contraction and may eventually be completely lost.

D. H., aged 21 years, first seen in April, 1937, complained of nyctalopia, which was first noticed about ten years previously. He also complained of itching, tearing, and pain above the brow. A previous diagnosis of retinitis pigmentosa had been made. Two uncles on the mother's side apparently had the same condition. Otherwise the family history was negative.

He had had a Nisserian infection one year ago; influenza and pleurisy at 16 years. The general health was at present good; Wassermann and Kahn tests were negative. Medical diagnosis: Avitaminosis.

In May, 1937, vision O.D. 10/200 could be improved to 20/70 with a —3.25 D. sph. ⊂⊃ —.37 D. cyl. ax. 180°; in the left eye 15/200 improved to 20/50 with a —3.25 D. sph. ⊂⊃ —.75 D. cyl. ax. 180°. Vision at present is O.D. 20/200 excentrically, and O.S. 20/100. Field studies in June showed concentric contraction for form and colors, much worse at this time.

The fundi now show characteristic absorption of the choroid in both eyes. The disc appears hyperemic in contrast to the white background, but is well outlined. The retinal vessels are attenuated and fairly straight. The macula is surrounded by a dense area of retinal and choroidal tissue. This is studded with fine brownish granules of pigment. There are many dense areas of pigment scattered throughout, which appear almost black in color. They do not resemble blood corpuscles in shape. There is almost a complete absence of choroidal vessels; only a few of the finer ones can be seen here and there. The left eye has almost the same appearance but less in extent.

Discussion. Dr. H. Maxwell Langdon did not think there was any doubt that this is a case of choroideremia. One point of

interest in choroideremia is the cause of the condition. The only explanation that appeals to him as at all plausible is that choroideremia is one of that great group that Treacher Collins believed to be the result of abiotrophy, examples of which are Tay Sachs disease and also pigmented degeneration of the retina. It seemed to him that this is possibly a degeneration of the choroid, akin to degeneration of the retina.

Dr. Sloane, in conclusion, said that he presented this case in order that he might obtain some helpful suggestions as to treatment. He had been treating the patient on the basis of avitaminosis, and the patient had improved generally. Myopia was discussed by Bedell, but he does not believe there is a direct relationship between the etiology of choroideremia and myopia. All cases reported by him were complicated by myopia. However, there are numerous cases of myopia that do not develop choroideremia.

Comparative Study of the Eyes of Arterial Hypertensive Persons and Animals with Persistent Experimental Hypertension

Dr. John E. L. Keyes (Cleveland) reported that H. Goldblatt had produced persistent arterial hypertension in animals (dog and monkey) by constricting the main renal arteries, which reduced the blood flow to the functioning components of the kidneys (renal ischemia). Hypertension resembling the benign and malignant types in man can be produced, depending upon the degree of constriction of the renal arteries.

The eyes of animals with this type of hypertension have been studied clinically and pathologically during more than four years. Visible changes in the eyes of hypertensive animals were a late manifestation. The earliest change noted ophthalmoscopically in dogs was usually an increased tortuosity of the retinal arteries. The next change was inconstant, even in the eyes of the same animals. In hypertensive dogs, variations in caliber of the arteries, retinal hemorrhages, retinal edema, retinal detachment, and perivasculitis or combinations of these early changes were noted. Later changes frequently present were: occlusion of arterial vessels, pigmentation of the retina, retinal scars, vitreous opacities, intraocular hemorrhage, secondary glaucoma, ulceration of the cornea, and cataract.

The ophthalmoscopic changes in the eyes of a hypertensive monkey (macaque) were similar to those seen in the eyes of some persons with hypertension.

Retinal hemorrhage and edema occurred soon after the production of renal ischemia. The changes in the arteries and arterioles progressed rapidly. After eight months of hypertension, the retinal arterial vessels were small; the light reflex was intense and very wide. Many small arteries and arterioles appeared as copper or silver streaks. Vascular tortuosity and irregularity of outline were noticeably absent.

In this series of hypertensive animals, papilledema occurred in only one instance. The absence of edema of the optic-nerve head is particularly noteworthy because in the eyes of several animals, both localized and general edema of the retina occurred.

Histologic examination of seven dogs' eyes and two monkeys' eyes revealed widespread arterial disease of varying severity. In dogs, the arteries of the retina showed the most severe changes. The choroidal arteries were affected to a lesser extent. In a monkey, the choroidal arteries were more diseased than were the retinal arteries. The arterial disease varied in severity in different eyes, in various

portions of the same eye, and even in different segments of the same vessel. The characteristic change was thickening of vessel wall.

Changes were seen involving the intima, media, and adventitia, either singly or in combination. The intimal changes consisted mainly of thickening due to hyalinization with or without evidence of previous proliferation. Spaces probably filled by lipids were noted. Proliferation and degeneration of elastic tissue were seen. Medical hypertrophy with collagenous degeneration occurred.

Other incidental pathologic changes noted were: pigmented retinal scars, localized hemorrhages in the retina, edema and degeneration of the retina, massive intraocular hemorrhage, edema of the choroid and ciliary body, detachment of the choroid and ciliary body, chronic retinitis, atrophy of the optic nerve, incipient cataract, and secondary glaucoma.

A comparison of the eyes of these hypertensive animals with the eyes of persons with essential hypertension revealed many changes in common. A noticeable exception was infrequency of papilledema in the hypertensive animals.

The ophthalmic histologic changes, in general, resembled very nearly those found in the eyes of hypertensive persons. The choroidal and retinal vascular disease was also similar to the vascular disease seen in the eyes of hypertensive individuals. In the eyes examined, more severe and wide-spread disease of the retinal arteries was observed in a dog than has yet been encountered in eyes of hypertensive persons. The histologic picture in two monkeys' eyes was very similar to the picture seen in several human eyes.

Discussion. Dr. W. A. Jeffers said that investigations into the control of blood pressure have, in the past, yielded important evidence concerning various mechanical, nervous, and endocrine factors involved. It has been demonstrated that certain types of arterial hypertension can result primarily from the dysfunction of one or another of these factors.

Progress in elucidating the pathogenesis of the so-called essential and malignant types of hypertension has been impeded, however, by the lack of a suitable experimental preparation which might properly be compared with these clinical types. The prolonged rise in blood pressure which results from constriction of the renal artery, as described by Dr. Goldblatt and Dr. Keyes, seems to be suitable in many respects for comparison with essential and malignant hypertension in humans. Numerous experiments with this preparation have served to indicate the probable humoral nature of its origin, and to allow some evaluation of proposed methods for lowering the blood pressure.

Dr. J. M. Hayman, Jr. (Cleveland) said that the importance of Dr. Keyes's work lies in the fact that he has the opportunity of studying the uncomplicated effect of hypertension on the retinal arteries. In human beings, there has been much debate as to whether vascular or hypertensive changes are primary. In these animals, we know that the hypertension comes first. There is the added advantage of being able to compare the results of hypertension of different degrees and in young and older animals. In certain patients with hypertension, we have seen the early changes described by Dr. Keyes when he has pointed them out to us. It is, of course, unnecessary to comment on the tremendous importance of being able to check ophthalmoscopic observations and impressions by histological sections.

A. G. Fewell,
Clerk.

COLORADO OPHTHALMOLOGICAL SOCIETY

November 20, 1937

DR. JAMES L. SHIELDS, *presiding*

ASPHERIC CONTACT LENSES

DR. FRITZ NELSON (by invitation) read a paper on this subject which was published in this Journal (July, 1938).

Discussion. Dr. George Stine stated that the blown glasses were not wholly satisfactory optically, as the corneal curve was never entirely free from astigmatism.

INTRAOCULAR TUMOR

DR. J. M. LAMME presented the case of Mrs. A. W., aged 38 years. In July, 1934, a well-defined elevation had been observed in the left eye, extending from the temporal disc margin to the macula. The retinal vessels had extended over this elevation. There was no surrounding retinal detachment. The transillumination was negative. A diagnosis of tumor of the choroid, probably sarcoma, was made at that time. In February, 1935, the elevated area was more extensive, and the central vision was destroyed. The patient did not return until November, 1937. At that time the left pupil was slightly larger than the right. The tension was normal. There was a large, circumscribed mass filling practically all of the temporal half of the globe. A diagnosis of sarcoma of the choroid has been made and enucleation has been advised.

DERMOID TUMOR OF THE LIMBUS

DR. CHARLES WALKER, JR., presented the case of Mr. M. R., aged 18 years, who had had a pinkish mass at the temporal limbus of the left eye since birth. This mass was about 3 mm. in diameter and was intimately adherent to the cornea and sclera. A few very fine hairs protruded from it. There had been no apparent growth of the tumor since infancy. Excision is contemplated.

HERPES ZOSTER OPHTHALMICUS

DR. CHARLES WALKER, JR., presented a case of typical herpes zoster ophthalmicus in a man of 23 years. There was only slight corneal involvement. He contemplated treating the patient with convalescent serum from a recent case of herpes zoster.

Discussion. Dr. W. H. Crisp recommended mild X-ray treatment for this ocular involvement.

Dr. Ralph Danielson reported two recent cases of herpes zoster complicated by abducens paralysis.

GONORRHEAL OPHTHALMIA TREATED WITH SULFANILAMIDE

DR. CHARLES WALKER, JR., reported the case of W. M., a 16-year-old Negro who came under his care three days after acquiring a gonorrheal conjunctivitis secondary to a urethritis. A corneal ulcer was present when first seen. In addition to irrigation, compresses, and atropine the patient was given sulfanilamide, grains 20, followed by grains 10, every four hours. Definite improvement followed. The ulcer became smaller and had completely healed by the tenth day, and the conjunctivitis rapidly disappeared. Urethral smears were still positive after two months of treatment. Dr. Walker stated that he considered sulfanilamide to be of great value in this case.

Discussion. Dr. George Stine, in discussing the use of sulfanilamide, reported that he had observed a case of transient myopia of 0.50 diopters develop during sulfanilamide therapy.

Dr. J. Leonard Swigert reported recovery from a streptococcic orbital cellulitis treated by sulfanilamide. A case of

bilateral gonorrheal iritis apparently became worse during similar treatment.

John C. Long,
Secretary.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

November 22, 1937

DR. ISAAC H. JONES, *president*

TREATMENT OF CANCER OF THE EYELIDS

DR. GEORGE S. SHARP (Pasadena, California; by invitation) stated that treatment of cancer of the eyelids is primarily one of irradiation, and that the lethal or cancercidal dosage is calculated according to the histological type and dimensions of the growth. He stated that this dosage is delivered by administering approximately one third of the required radiation by an external source such as a radium plaque or low voltage X rays, and that the remaining two thirds is given by interstitial means such as radium needles or radon seeds. From radiation procedures one may expect complete regression of the cancer, with a minimum deformity and no late radiation effects in the lens, cornea, conjunctiva, or skin.

He mentioned that 60 patients with cancer of the eyelids were treated from 1932 to 1937, inclusively, although a positive pathological report was obtained on 48 cases only, and the latter group was considered in this discussion. The follow-up has included 92 percent of the patients with a pathological report. Many of the patients have not yet lived five years after their treatment, but all patients have survived over one year, and there has been no evidence of recurrence nor complicating deformity in this series of cases.

Discussion. Dr. Sharp said that the cutaneous scar has caused no complications in any of the patients to date, but the radiation effect on the conjunctiva has caused persistent dryness, which may result in excessive tearing. None of the patients have had complications such as ectropion, and the scars are not painful. Radium was the method of choice in these cases because it is more effective in his hands.

The patients demonstrated were all treated during the past five years, and so only a small group have been free of disease long enough for the occurrence of late radiation effects. No damage to the lens has been observed in any of these cases, and no cataracts have appeared.

It is not necessary to use any shield for the interstitial treatment, since the distance safeguards against any appreciable amount of radiation to the eyeball. A shield is necessary in all instances when external irradiation is used, and he has found one millimeter of lead against the eye side of the radium plaque to be the most effective means of shielding the eye.

Not all of the patients have been followed five years, but no recurrences have been demonstrated in any of the group. Only a small number of these growths were of the squamous-cell type and no metastases have been observed in this group.

Harold F. Whalman,
Editor.

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THE ACADEMY'S SECTION ON INSTRUCTION

The volume for 1922 of the Transactions of the American Academy of Ophthalmology and Otolaryngology contains a brief report concerning the "Section on Instruction." The report begins with the statement that the previous year (namely 1921) had marked the opening of this new type of work in the Academy. A new committee, under the chairmanship of Harry S. Gradle, had been appointed "under the direction of the Council." There may have been other members on the committee, but history, in the form of the Academy Transactions, does not appear to offer information on this point. Perhaps the editors of volumes of society transactions are not always fully aware of the needs of future historians of ophthalmology and otolaryngology. And perhaps the average member of the Academy does not particularly care about the prospective work of such historians, but is more concerned with the fact that Gradle's name has been most worthily associated with the activities of the "Section on Instruction" for the past 16 or 17 years.

There are probably few ophthalmologists of the United States who do not regard the instructional "conferences" of the Academy as representing the most important innovation of the past quarter of a century in the activities of medical conventions. The reception given to the conferences may be taken as very healthy evidence of the eager-mindedness of the medical profession in this country. We may have our educational defects, but we desire to correct them.

As a prominent officer of the Academy

* Deceased.

has remarked, the Academy's funds could hardly be put to better purpose than the dissemination of professional knowledge. The conferences serve a splendid purpose —a far more useful purpose than is commonly served by the mere making of speeches or writing of papers. They bring into close contact, on each of a wide variety of topics, one who is presumably an expert in a special line of thought and activity and successive groups of those who desire to absorb such expert knowledge or to improve their acquaintance with the particular array of facts presented.

But do the conferences go far enough? They are often rather advanced than basic. There are many who by force of circumstances (sometimes economic circumstances) were launched upon the practice of ophthalmology and otolaryngology with inadequate training in fundamentals of their specialty. To a limited number each year, the Academy's instructional work in pathology undertakes to fill an important gap in professional training. But there is room for somewhat longer courses in other individual topics such as anatomy and surgery, physiologic optics, ophthalmoscopy, and neurologic ophthalmology, to be given periodically in recognized centers, and by teachers officially recognized as competent. Such courses, if they were to be given repeatedly by the same group of teachers and in different regions, would not only call for businesslike and farsighted organization, but would need to be planned on the basis of a reasonable financial remuneration to the selected teachers. The choice of a suitable teaching staff would demand balanced understanding and judgment, it should be handled purely for the advantage of the practitioner-student and by no means as a mere compliment to the lecturer; and it should be remembered that the ability to teach is a special faculty, something beyond the possession of professional knowledge and skill.

A few years ago, in Academy circles, there was some discussion of a plan for assembling a list of recognized teachers who would be available for instructional courses at various points throughout the country. The plan has not been heard of for some time. It is said that organizers of special courses of one or two weeks intimated that they were quite capable of taking care of their own affairs when it came to the selection of lecturers or demonstrators. But the germ idea seems to be a good one and may be revived sooner or later. If the development of socialized medicine is as rapid and extensive as some anticipate and many fear, renewal of study habit may become one day a governmental requirement. A medical diploma, a license to practice medicine, even the certificate of the American Board of Ophthalmology or of the American Board of Otolaryngology, does not assure progressive mentality on the part of the practitioner.

Harry Gradle's many years of successful effort in connection with the Section on Instruction encourage the expectation that his term of office as President of the Academy will see a larger development of the educational movement which he has fostered so indefatigably.

W. H. Crisp.

SKILL FOR OPHTHALMIC SURGERY

Operative skill lies in the knowledge and the coördination of the operator. Surgical skill, a more important thing than operative skill, includes thought, judgment, therapeutic knowledge, wisdom developed by years of thought and observation along lines of medicine and the allied biological and physical sciences. These skills are not attained by study of

any particular curriculum, nor by observation of other operators in any particular place. They can be taught only to the extent that the thought of a certain teacher stimulates the thought of a certain hearer. The foundation of operative and surgical skill must be laid in certain preparatory studies and mechanical training. With these and an alert mind, the young surgeon may approach his first capital operation with confidence that he has the only kind of experience that counts for successful operations. Knowledge of the surgical anatomy and physiology of the eye gives a reasonable preparation, which neither years of blind repetition nor the acclaim of former patients who have passed through his hands without serious harm can give.

These preparatory studies for the surgeon who hopes to operate on the eye are:

(1) The thorough study of the anatomy of the eye. All medical students learn something about the eye. But they do not learn the surgical anatomy of the eye as they art taught the surgical anatomy of other parts of the body; and, in its surgical anatomy and physiology, the eye differs from all other parts of the body. For the operative surgery of the eye, its special anatomy and physiology are of the highest importance.

(2) The physiology of the eye must be studied. Not as a branch of academic learning, but by experiment with the student's own eyes. The varied effects of light on the eye, its adaptations, afterimages, pupillary reactions, best illuminations for various purposes, and the usual aberrations of the eye are all of interest. They should be mastered before an attempt is made to answer the questions of patients, or to instruct them in the care and use of the eyes. Then the principles of other optical instruments should be understood, as a preliminary to understanding the optics of the most delicate and important of all optical instruments, the human eye.

The development and growth of the eye through changes it undergoes with age, the peculiarities of its nutrition and metabolism belong among the basic studies for the ophthalmic surgeon.

Edward Jackson.

OCULAR TESTS IN THE SCHOOLS

An important question now demanding an answer is whether there shall be ocular examinations in schools and, if so, how extensive shall they be. The primary purpose of schools is education. In all but boarding schools matters of health concern the school only as they are related to the educational welfare of the child or have a bearing on his school associates. Schools are not involved directly in his general-health problem otherwise.

Since his scholastic progress depends on vision, assurance must be had that the child's visual efficiency is satisfactory. To obtain an adequate record of this in every case from sources external to the school would be practically impossible, for this is a technical problem, to determine which many physicians are not equipped even were it possible to get the necessary coöperation to have the tests made and the reports submitted.

It therefore seems strongly advisable to conduct the required tests within the schools.

Obviously the minimum necessary examinations should be made. They would include some test for visual acuity, since no one would question the need for adequate vision to see blackboard demonstrations and books on the desk, as well as an examination of the lids, conjunctivae, and eyeball externally. Perhaps there may be comparative agreement

with regard to the foregoing, but from this point there will be increasing differences of opinion.

The finding of good vision, normal external appearance, and the absence of history of ocular discomfort including headache will surely eliminate most of the cases of serious eye pathology. These simple tests and the necessary questions related to discomfort can be handled by the school physician in his routine examination. An ophthalmoscopic examination would require much more time, darkroom facilities, and a specially trained examiner. To be sure an occasional case of pathology would be discovered, but this would occur very rarely, not sufficiently often to justify such examinations in every school child. Probably there would not be much disagreement about this point.

The real question arises when we attempt to test and evaluate the subtle factors which may have a bearing on efficiency in reading, such as muscle power and fusion. Outstanding reading disability probably occurs in from 1 to 5 percent of children; minor reading difficulty in perhaps twice that number.

Somewhat elaborate tests have been devised to detect reading disabilities, consisting in having the individual read a given paragraph scaled for his school grade and timing him, noting the number and character of his errors. Each eye is tried separately and then both together. Interestingly, the introduction of the second eye at times causes an inhibition instead of an increase of efficiency as one might expect. From a limited experience the writer thinks that something can be learned from this but that the test lacks much in accuracy and is only suggestive, unless perhaps much time were taken in the study of each individual.

Then there are tests for fusion and muscular efficiency. These are the principal bones of contention between ophthalmologists and lay examiners: the tendency of the former being to think that it is easy to lay too much stress on such tests and that if made they should be in the hands of ophthalmologists; of the latter to think that they have great importance and can safely be handled by school teachers.

This vexatious problem cannot be escaped, and it is well that such studies as those reported among the original articles in this issue are being made.

Lawrence T. Post.

BOOK NOTICES

ETIOLOGIA DEL DISTACCO DI RETINA (The etiology of detachment of the retina). By Prof. Dario Sabbadini. Rome, Tipografia Regionale, 1937. Paper covers, 269 pages, price not stated. Dedicated to Di Marzio.

One of the first enthusiastic followers of Gonin, Professor Sabbadini has dealt with the problem of the etiology of retinal detachment in numerous contributions, clinically and medicolegally, notably at the Madrid Congress and at the Reunion Gonin at Nancy. In this monograph, following Gonin's suggestion and considering the pathogenesis and surgery based on it solved, Sabbadini has concentrated on the etiology. The distinction between pathogenesis and etiology, less honored in ophthalmology than in general medicine, is stressed, and illustrated by defining tuberculous uveitis as etiologically tuberculosis and pathogenetically uveitis in relation to detachment. This distinction between the *causa prima* and the disease in which the detachment is the last link has been rigorously applied to an analysis of 130 cases, with some additional cases of the author's, and to a survey of the literature. The result is a

well-balanced, orderly, lucid, and logical presentation of the subject, and an important contribution to ophthalmology.

At the outset, the author notes that, aside from the strictly locally determined detachments by injuries, tumors, and neoplasms, all others fall readily into two distinct groups: those with clear-cut and those with obscure etiology. The former are acute, benign, *without retinal tears,* tend to spontaneous recovery, obviously due to choroidal exudates or transudates, and found associated with "acute general disease"—acute infections with renal complications, albuminuria, pregnancy. The latter are slow in evolution, have no tendency to spontaneous recovery, *present retinal tears,* and are found associated with disease of great chronicity or in apparent absence of general disease, and with choroidal disease, occasionally retinal alone, and fluid degenerated vitreous. These latter, so-called idiopathic, constitute the subject of the inquiry.

Studying his cases with this etiologic "key" or law in view, Sabbadini finds the following etiologic incidence: tuberculosis—26.92 percent, lues—21.53 percent, renal-vascular—20 percent, traumatic—7.69 percent, diabetes—3.84 percent, endocrinopathies—1.53 percent, sinusitis—0.76 percent, rheumatism—0.76 percent, mixed lues-tuberculosis—3.07 percent, cryptogenic or incompletely studied—13.84 percent.

In agreement with current opinion, the author does not list myopia as an etiologic factor, the basic factor being considered either lues or tuberculosis. Senility is also considered another name for renal-vascular etiology. Heredity is similarly dealt with. Uric-acid diathesis, a frigore, malaria, and other rare etiologies found in the literature are considered merely as contributing causes.

In the diagnosis of tuberculosis, the author depends primarily on anamnesis and a positive roentgenogram, particularly teleradiography, of the chest, and the choroidal lesions, following Neumann, are considered either related to the primary pulmonary focus and of slow evolution in situ or as post-primary reinfections according to Gamna, and are characterized by discreteness, tendency to chronicity, and cystoid degeneration rather than by lack of pigmentation. In diagnosing lues anamnesis also plays a great rôle. In both a heterogeneity, that is, lack of correspondence between the stage of the general disease and ocular lesion, is stressed. In dealing with the renal-vascular group, the etiologic problem is found complicated by the late stage at which the detachment is seen, when the true etiologic factor—chronic nephritis, arteriosclerosis, and essential hypertension—is no more discernible in the vicious circle. Examination of the fellow eye, particularly in the light of the recent work of Friedenwald, Guist, and Greppi, it is hoped, will help in the future. The essential-hypertension factor may be diagnosed by the existence of retinal disease without choroidal disease. The pathogenesis otherwise, following Gonin, Vogt, Lindner, Amsler, and Arruga, is considered choroidal disease, retinovitreous adhesions and a retinal tear as the links in the chain leading to detachments.

Injuries are etiologically dealt with from their clinical as well as medicolegal aspects, since they may affect defective or diseased eyes. Clinically, the inquiry is directed toward the effects of injuries on healthy and on predisposed eyes. Following Brückner, direct and indirect injuries are deemed to differ only in the degree of requisite intensity, the detachments resulting found to be with and without tears and having a good prognosis. A retinal tear, in line with the etiologic law, however, is always found in predisposed eyes. Chorioretinal adhesions

may, however, prevent a detachment in an apparently predisposed eye, as the author found in an extraction complicated by hemorrhage in a myopic patient with luetic uveitis.

Medicolegally, the author, who is the Chief Consulting Ophthalmologist of the National Board for Social Welfare of Italy, representing the interests of the insured workers, appeals to clinical experience as guide and takes up a middle ground, admonishes us to think not only of the previous state of the eye injured but also of the intensity of the force applied to it in a medicolegal case, believes Leber's scepticism no longer tenable in regard to moderate injuries leading to detachments, would exclude such slight injuries as foreign bodies in the conjunctival sac and slight blows on the head as cause, but, on the other hand, would not consider sneezing, often described as a slight injury, in the same category, and requires severe and moderate injuries to find cause.

This reviewer's struggles with the medicolegal problems involved, embodied in a Madrid Congress contribution, are noted by the author. Theoretically conservative, but practically liberal, as one can see from the cases discussed, the author's self-inflicted difficulty would seem to consist in not abandoning the legal notion of "violence" and in not standing firmly on medical grounds. Medically, neither reconstruction of the intensity of an accidental force of brief duration, nor a measure of its effect on a particular spot of the retina, if reconstructed, is possible. Overlooked intraocular foreign bodies and minor eye-contusion syndromes testify to the difficulty. Medically, by accepting the pathogenetic rôle of the tear, rejecting vitreous traction but accepting vitreous mass movements in the detachment genesis, there seems to be no option but to regard all detachments as involving a traumatic factor, not necessarily industrial, and to rely entirely on the bona fides of the accident and the temporal nexus, which the author sets at 20 days and the reviewer at two weeks, and both allowing for special circumstances.

In conclusion, the author suggests the abandonment of the term "idiopathic" in favor of "cryptogenic," with the hope that in 10 to 20 years the latter term will also be dispensed with. In the meantime, a plea is made for studying the organism as a whole in search of a general organic cause in retinal detachment, and thus prevent detachments in myopic eyes, cure detachments "specifically" and not merely operate on them.

This is a timely book destined to become a classic.

M. Davidson.

LES MEDICATIONS DE CHOC EN OPHTALMOLOGIE (Shock treatment in ophthalmology). By L. Hambresin. Masson et Cie, editors, Paris. Report presented at the French Society of Ophthalmology, May 17, 1938. 250 pages, paper covers.

This is one of the publications of the French Society of Ophthalmology. It covers the subject of shock treatment in ophthalmology very completely. In the first chapter the phenomena of shock are explained, and in the second the therapeutics. The following eight chapters are devoted to the various agents commonly used to produce shock, and the final section explains shock treatment in 33 different pathological conditions.

Some of the author's conclusions are as follows: Shock-producing medication is not specific and its exact mechanism is unknown, although it is probably very complex. Somehow it calls up all the

defense elements in the subject, especially the reticulo-endothelial system.

Important contraindications are tuberculosis, cardiac lesions, and diabetes.

Of the various possible agents for producing shock some are more potent than others; for example, autohemotherapy causes less reaction than does foreign protein. If one agent fails another may succeed. Some have thought that the febrile element was not important, but the author regards it as a very valuable part; certainly the high temperature (40° C.) is necessary in gonococcic infections in order to raise the temperature of the patient above the thermal death point of the gonococcus. He advises learning how to use a few agents well, as the manner of using them is more important than the nature of the agent.

Acute localized inflammations usually react more favorably than do acute generalized infections.

The consensus of opinion is that shock therapy is an exceedingly valuable addition to our therapeutic armamentarium and has the advantage of acting as an adjuvant to other forms of therapy. Milk is apparently the favorite of most ophthalmologists.

There are many diseases in which shock treatment is valuable; among the most important are gonorrheal diseases of the eyes, first and foremost; second, keratitis with hypopyon; third, iritis; and last, wound infections.

This volume is a worthy addition to the splendid series already published by this notable society.

Lawrence T. Post.

INTRODUCTION TO CLINICAL PERIMETRY. By H. M. Traquair. Third edition, clothbound, 320 pages with 227 illustrations. St. Louis, C. V. Mosby Company, 1938. Price, $9.00.

The recent third edition of this standard work on perimetry retains, in general, the form and content of the previous editions. The text has been revised and in parts rearranged and amplified. Forty-eight new illustrations have been added.

The first part consists of a discussion of the technique of perimetry and of the physiology of the visual field in relation to clinical perimetry. The second part discusses the pathological field and the interpretation of the changes in the visual fields caused by lesions at various levels in the visual pathway.

This work will continue to be one of the most valuable texts available for the student of perimetry, for it completely covers the subject, emphasizing the quantitative method.

T. E. Sanders.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

5

CONJUNCTIVA

Rebucci, Enzo. **Contribution to the treatment of eczematous or phlyctenular keratoconjunctivitis.** Boll. d'Ocul., 1937, v. 16, Nov., pp. 1131-1145.

The writer gives the history of ten children aged from two to ten years and affected by this disease. He supports the belief in the origin of the disorder in two etiologic factors, the tubercle bacillus and intestinal toxemia. He recommends a special diet (given in detail) which is said to bring rapid recovery in nontuberculous cases. (Bibliography.) M. Lombardo.

Schmidt, Jenó. **Tuberculosis of the bulbar conjunctiva.** Graefe's Arch., 1938, v. 138, pt. 5, pp. 661-666.

In a 36-year-old woman, a small growth had been present for about six months in the bulbar conjunctiva at the corneoscleral junction on the nasal side. Histologic examination of sections from the excised growth showed infiltration of pinguecular tissue with chiefly small lymphocytes but also epithelioid and Langhan's giant cells. H. D. Lamb.

Schmierer, Marga. **Case illustrating ectogenous tuberculosis of the conjunctiva.** Klin. M. f. Augenh., 1938, v. 100, May, p. 683.

A woman of 38 years, who for a few months had had the care of a tuberculous cow, noticed in January, 1937, a swelling of the upper lid and redness of the right eye due to nodular excrescences in the retrotarsal fold. An excised piece of the conjunctiva showed typical tuberculous granulation tissue. About two weeks later the right parotid and submaxillary glands became swollen. Incision evacuated pus which contained tubercle bacilli. In March the lid was swollen and very painful, and the whole tarsal conjunctiva converted into a hard nodular granulation mass. Excised pieces transplanted into the anterior chamber of a rabbit produced after three weeks typical chronic nodular iritis and after three more weeks an autopsy on the killed animal showed tuberculous changes in other organs. After excision of the diseased tissue, application of roentgen rays, lactic acid twenty percent, and general supportive treatment, the affection was cured. The

intensive reaction of the regional glands of one side and the absence of tuberculous changes in the body established the diagnosis of ectogenous tuberculosis. C. Zimmermann.

Thygeson, Philips. **Treatment of conjunctivitis.** Arch. of Ophth., 1938, v. 19, April, pp. 586-608.

This review discusses the mechanism of bacterial infection of the conjunctiva, together with its defensive reactions, and an outline of the more important methods of treatment, with special emphasis on the value of determining the cause whenever possible.

J. Hewitt Judd.

6

CORNEA AND SCLERA

Blobner, Ferdinand. **Crystalline degeneration of conjunctiva and cornea.** Klin. M. f. Augenh., 1938, v. 100, April, p. 588. (See Section 5, Conjunctiva.)

Cowan, A., and Cowan, T. H. **Superficial punctate keratitis, its treatment with iodine solutions.** Arch. of Ophth., 1938, v. 19, May, pp. 709-713.

Twelve cases of superficial punctate keratitis treated with iodine preparations are reported. At home a one-percent solution of potassium iodide containing one or two minims of compound solution of iodine is instilled into both eyes three times a day. In the office conjunctival packs of Pregl solution are used for ten minutes and repeated at intervals up to four days. In most of the patients treated in this manner a quick resolution of the lesions was noted, with freedom from, or delayed, recurrence. T. E. Sanders.

Jakobovitz, R. **Retrocorneal strands in the anterior chamber after parenchymatous keratitis.** Zeit. f. Augenh., 1938, v. 94, April, p. 325.

The author describes an eye in which a strand of characteristic structure developed in the anterior chamber after parenchymatous keratitis. Only two other such cases have appeared in the literature. Common to all were localization behind the cornea, a yellowish thread-like core, and a highly refractile adventitia-like tunic, which occasionally had cross striations. The ends branched dichotomously and then became attached to the posterior corneal surface by small grayish pads. In one, a branch was attached to the iris. All occurred after parenchymatous keratitis, but this may be accidental, since the structure arises most probably in an iritic exudate. It seems probable that a thread of fibrin becomes organized and covered with proliferated endothelium. These structures should be differentiated from the linear vitreous protuberances from the posterior corneal surface which are sometimes seen.

F. Herbert Haessler.

Kayser, B. **Concerning the Krukenberg-Axenfeld corneal spindle.** Klin. M. f. Augenh., 1938, v. 100, May, p. 752.

Histologic examination revealed that apart from megalocornea and scattering of pigment the eye was perfectly healthy and showed no inflammatory or degenerative changes or disposition to glaucoma. Hence the assumption by Vannas, quoted by Sommer, that eyes with much scattering of pigment are diseased is not correct. In these apparently healthy and robust persons, with otherwise healthy eyes, the retinal pigment layer of the iris becomes disintegrated and the pigment is flushed into the anterior chamber and deposited. This migration is apparently slow, so that glaucoma seldom ensues.

C. Zimmermann.

Nastri, Francesco. **A case of Fehr's keratitis associated with Recklinghausen's disease.** Boll. d'Ocul., 1938, v. 16, Nov., pp. 1118-1130.

The history is given of a woman of 44 years who showed the typical skin lesions of Recklinghausen's disease and central opacities of both corneas. These were transparent at the periphery, where small greyish-white or yellowish opacities were visible, especially below. The writer hints the possibility that a pathogenetic relation exists between the corneal lesion and the generalized neurofibromatosis, in so far as they might be different localizations of the same process having at its base the same local nervous changes. (Bibliography, table.) M. Lombardo.

Richner, H. **Affection of the cornea in hereditary keratoma palmare et plantare.** Klin. M. f. Augenh., 1938, v. 100, April, p. 580.

A boy aged seven years suffered for three months from intense photophobia and epiphora due to very fine superficial dendritic or spiral avascular epithelial defects of the cornea. This type of corneal participation has never been observed in congenital dyskeratosis or in keratoma palmare et plantare hereditarium, from which the patient suffered. A sister of twelve years, who at the age of four years had been treated at an eye clinic for photophobia without redness of the eyes, also had hyperkeratosis of the feet and of the terminal phalanges of the hands. The symmetric affection of the corneas and its familial occurrence suggest a parallelism with the skin disease and participation of different tissues related to the skin, hyperhidrosis, and degeneration at the outer sides of the extremities. It is attributed to defective development. (Illustrations.) C. Zimmermann.

Rucker, C. W. **Keratitis sicca.** Arch. of Ophth., 1938, v. 19, April, pp. 584-585.

A girl aged seventeen years was completely relieved of this condition after closure of the four canaliculi and instillation of artificial tears.

J. Hewitt Judd.

Steinseifer, Werner. **The use of an electrocautery in ulcus serpens.** Zeit. f. Augenh., 1938, v. 95, May, p. 51.

For the treatment of corneal lesions, Passow modified the Wessely steam cautery so that heat was produced by a heating coil of nickel-alloy wire. A thermometer can also be inserted into the cautery point. For small ulcers a temperature of 80 to 100° C. is advised; for deeper lesions, 100 to 120°. The author tabulates the visual acuity before and after treatment of twenty eyes with ulcus serpens and twenty with corneal herpes. Of the former, fourteen received only one treatment and five healed after two treatments. In most of the eyes, the vision after healing was improved or at least no worse than before treatment. Herpes usually healed very promptly after one application of the cautery. F. Herbert Haessler.

Thomas, J. W. T. **The technique of corneal transplantation with recent modifications.** Trans. Ophth. Soc. United Kingdom, 1937, v. 57, pt. 2, p. 520.

The modifications of technique first described in 1935 by the author are restated. Instead of in oil, the graft is placed in saline, because the oil adheres to the graft in the patient, and interferes with nutrition, although in rabbits it did not seem to interfere because the rabbit would be moving about and any oil globules would go to the top of the anterior chamber and not be in con-

tact with the transplant. The technique for inserting intracorneal cross-stitches is such that the knots do not lie on the graft.

In seven patients, operated on by this modified technique, the grafts all became united. Beulah Cushman.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Cohen, Martin. **Choroidal sclerosis in coronary arteriosclerosis.** Arch. of Ophth., 1938, v. 19, April, pp. 487-496.

The development of bilateral choroidal sclerosis was observed in a man, aged 69 years, nine years after coronary sclerosis had been diagnosed. Macular pallor first appeared and was gradually followed by sclerosis of the choroidal vessels and by choroidal degeneration. The eyes were observed frequently until the patient's death ten years after the first examination. Both eyes were obtained for histologic examination. The changes showed a focal localization and consisted of depigmentation, relative fibrosis and atrophy of the choroid, and sclerosis of the choroidal arteries. The lesions were apparently of the degenerative type without alteration of the thickness of the walls or encroachment on the lumens, and differed from the hyperplastic changes in the vessel walls observed in cases of essential hypertension and chronic glomerular nephritis. The author believes that coronary sclerosis and choroidal sclerosis are not independent but associated conditions. J. Hewitt Judd.

Dusik, K. T., and Pichler, E. **Concerning the influence of insulin-shock therapy in schizophreny upon the "anterior chamber reaction" of Gamper, Kral, and Stein.** Klin. Woch., 1938, v. 16, April 2, pp. 509-511.

Gamper, Kral, and Stein demonstrated that injection of cerebrospinal fluid of patients with schizophreny or organic nervous diseases into the anterior chamber of rabbits caused considerable exudative inflammation of the anterior segment of the eye, while the fluid of normal persons and of patients with nonorganic mental diseases did not produce such a reaction. This appears to be the biologic proof for the assumption that schizophreny is an organic cerebral disease.

The authors made this test in eighteen schizophrenic patients before, during, and after insulin-shock therapy, and found that in those patients in whom this therapy brought about improvement the formerly strongly positive reaction became negative or weakly positive. They urge further investigation of this biologic reaction. Bertha Klien.

Friedenwald, J. S., and Stiehler, R. D. **Mechanism of formation of the aqueous.** Trans. Amer. Ophth. Soc., 1937, v. 35, p. 184.

Experimental evidence points to the presence of a semipermeable membrane between the epithelium and the stroma of the ciliary body. The selective permeability demonstrated is due to the negative electrical charge on the membrane, which has an isoelectric point at p_H 5.485. A positive charge, produced by the presence of more acid solutions, reverses the permeability. The application of an electrical potential across the membrane induces an electro-endosmotic flow of water through the membrane. Differences in oxidation-reduction potential point to the presence of oxidative enzymes in the epithelium and it is argued that the physiologic

flow of water from stroma to epithelium is, in part, the result of electro-endosmosis. David Harrington.

Marshall, Don. **Free cyst in the anterior chamber.** Arch. of Ophth., 1938, v. 19, May, pp. 766-768.

A case of free cyst in the anterior chamber of a boy of eleven years is reported. Surgical removal was not attempted. T. E. Sanders.

Oláh, Emil. **New observations on iritis rosacea.** Klin. M. f. Augenh., 1938, v. 103, May, p. 714.

A man of 54 years complained for two weeks of an inflammation of his left eye. It showed moderate ciliary injection, but no corneal change. Vision was not impaired but there were slight pain and photophobia. The pupillary zone of the iris was normal, but the ciliary zone was gray and dirty brown and no delineation was visible. Instillation of a drop of scopolamine immediately produced pupillary mydriasis but relaxation of the ciliary zone did not set in until two months later, after recovery. Although there was no keratitis rosacea (which has existed in every case so far published) the mode of pupillary reaction was characteristic of iritis rosacea. It is a primary process which occurs in endocrine dysfunction in certain groups of capillaries. In this case, besides rosacea of the face, two symptoms of endocrine dysfunction were present, namely obesity and atrophy of one testicle. Obesity was also observed in the patient's two brothers. Glandular injections effected a cure. The author concludes that iritis rosacea may be observed as a solitary phenomenon of ocular rosacea. The clinical picture differs much from the typical aspect. Probably it is of endogenous origin and hormone therapy must be employed in every serious and obstinate case.

C. Zimmermann.

Stockmann, Herbert. **The color of the eyes.** Klin. M. f. Augenh., 1938, v. 100, May, p. 692.

Statistics state that the percentage of persons with brown eyes is generally smaller at higher ages. Stockmann has studied this question and reaches the following conclusions: the color of the eye is an expression of the effect of light on the iris. Its determination depends upon the observer, the eye color itself, and the distance between the two. Change of eye color is a consequence of change of light or of the anatomical conditions of the iris. The eye color of European children at birth is dark violet-black blue over which a greyish-blue veil is spread. This basic color endures to about the second year of life. The anatomic causes for change of eye color are: up to the second year mostly tissue development of the stroma of the iris and, in individuals who have not blue eyes, the pigment development in the anterior limiting layer; from the second to the twentieth year changes of structure of iris tissue and fluctuations of pigment content; after the 55th year changes in cellular elements of the iris.

C. Zimmermann.

Webb, W. S. **Detachment of choroid.** Texas State Jour. Med., 1937, v. 33, Oct., p. 460.

A brief review of the clinical findings is followed by a report of three cases illustrating some of the common causes and end results.

Complete detachments usually end in permanent blindness. Incomplete detachments usually reattach themselves and the vision is restored without any

special treatment; this being true of cases from accidental injury as well as the cases of intraocular surgery. Detachment in high myopic cases frequently results in permanent detachment of the retina. In selected cases the detached retinas respond to corrective treatment. F. M. Crage.

8

GLAUCOMA AND OCULAR TENSION

Barkan, Otto. **Technique of goniotomy.** Arch. of Ophth., 1938, v. 19, Feb., pp. 217-223.

This operation is indicated in those cases of chronic glaucoma with an open angle and normal depth of anterior chamber. Success depends on proper selection of suitable cases by preoperative biomicroscopic examination and the use of a specially made contact glass. The indications, technique, and postoperative care are discussed. The contact glass gives a magnified picture of the inside of the anterior-chamber angle, so that the surgeon is able under direct vision to guide his knife from the temporal limbus across the anterior chamber until it is inserted into that part of the trabeculum on the oposite side covering Schlemm's canal. A counterclockwise incision is then made here for about one fourth of the circumference. No complications or injurious sequelae have occurred in 25 eyes operated on by this method. J. Hewitt Judd.

Benham, G. H., Duke-Elder, W. S., and Hodgson, T. H. **The osmotic pressure of the aqueous humour in the normal and glaucomatous eye.** Jour. of Physiology, 1938, v. 92, April 14, p. 355.

After giving numerous experimental data on the subject, the authors conclude that the molar concentration of the aqueous humor of man, the dog, and the cat is higher than that of the corresponding serum by an amount averaging 0.004 M* NaCl. The immediate effect of ether anesthesia is to raise the molar concentration of the blood by as much as 0.01 M NaCl, so that the normal relationship between blood and aqueous humor is reversed. Pathologic intraocular tension is not a simple function of the osmotic balance between blood and aqueous humor. In view of the osmotic relationship between the intraocular fluid and the blood, the former cannot be a simple dialyzate. (5 references.) Ralph W. Danielson.

* M = Molar.

Clay, G. E., and Baird, J. M. **Ocular changes experimentally produced in thyroparathyroidectomized dogs, with special reference to intraocular tension and blood pressure.** Trans Amer. Ophth. Soc., 1937, v. 35, p. 201.

Experimental proof is offered that thyroparathyroid deficiency produces intraocular and vascular hypotony. A smaller amount of aqueous being formed, it is stagnant and of improper nutritional value, and is responsible for the development of vitreous opacities and cataracts. Ocular hypotension is considered an essential disease.

David Harrington.

Czukrász, Ida. **The operation of iridodialysis.** Klin. M. f. Augenh., 1938, v. 100, May, p. 721.

Three 2-mm. incisions were made with a fine narrow lance knife 1 mm. behind the corneal border, first the central and then the two lateral. With a blunt iris hook introduced through the central cut the peripheral iris was grasped and drawn into the canal and then in a similar fashion the two lateral incarcerations were performed. In the after treatment intense atropine my-

driasis must be maintained. Without exception the results were good.

C. Zimmermann.

Diete, E. H. **The disintegration of solutions of eserine, pilocarpine and doryl, and the tolerability of highly concentrated pilocarpine solutions.** Klin. F. f. Augenh., 1938, v. 100, April, p. 597.

Diete tested on the eyes of rabbits the extent to which watery solutions of these miotics become disintegrated by long standing or repeated boiling. He shows the results in curves compared with curves obtained by use of fresh solutions. Eserine loses none of its pupillomotor power, or the duration thereof. The red color of eserine solutions after boiling or long standing is no indicator of diminished action. Pilocarpine suffers only slight diminution of pupillomotor power by boiling and long standing. The duration of action of pilocarpine is not decreased by prolonged boiling but considerably by long standing. Doryl shows only shortened duration of action. Thus the danger of deterioration of clinically used solutions is overestimated. Very concentrated solutions of pilocarpine, up to 10 percent, can be applied without disagreeable results. C. Zimmermann.

Elwyn, Herman. **Pathogenesis of chronic simple glaucoma.** Arch. of Ophth., 1938, v. 19, June, pp. 986-1008.

The author first reviews the physiology of the intraocular pressure and the theories of the etiology of chronic simple glaucoma. He advances a theory of the pathogenesis of glaucoma, stating that in certain persons, as a result of inherited influences, the mechanism for maintenance of normal intraocular pressure is constitutionally inferior. In advancing life this mechanism loses its normal stability and incompletely maintains the normal intraocular pressure. The change may be either in the mechanism as a whole or in its central regulation. T. E. Sanders.

Favalore, G. **Glaucoma anterius of Contino.** Klin. M. f. Augenh., 1938, v. 100, May, p. 745.

Contino and Favaloro distinguish a definite nosologically circumscribed kind of glaucoma which so far has not been classed under the known types of glaucoma. It always occurs in irritative painful form, of subacute course, with venous or arterial ciliary hyperemia, edema of the cornea, deep anterior chamber (the most important and constant symptom), slight mydriasis, and increased tension, and with or without hemorrhages in the anterior chamber. Favaloro observed the following clinical types: (1) irritative glaucoma anterior without new formation of vessels of the iris, (2) with venous new-formation in the iris, (3) with venous new-formation and hemorrhages (true angiopathic hemorrhagic glaucoma), (4) with precipitation on Descemet's membrane (real inflammatory glaucoma), (5) glaucoma anterius hemorrhagicum without vascularization of the iris, and (6) posthemorrhagic glaucoma or ophthalmic angiopathy with secondary hypertension. Only insufficiency of the anterior lymphatic and blood filtration paths can explain the retention in the anterior chamber. For type 4 pilocarpine has been employed. For all other forms mydriatics are recommended as counteracting congestion of iris and ciliary body and the objective irritative phenomena and pain, although less satisfactory as regards hypertension and thus not preserving or restoring vision. Local medicinal

must be supported by general therapy and by surgical procedures.

C. Zimmermann.

Gordon, B. L. **The problem of glaucoma.** Arch. of Ophth., 1938, v. 19, April, pp. 515-547.

The author traces the development of our conception of glaucoma from the earliest records of the disease among the ancient Hebrews, Greeks, Romans, and Byzantines to the present time. About 1348, Sams-al-din first identified and described as "migraine of the eye" the condition now known as glaucoma. Bannister (1626) described it as a form of incurable cataract accompanied by hardness of the eyeball. Brisseau (1709) was first to conclude that glaucoma was not related to cataract. After the invention of the ophthalmoscope, the detection of excavation of the disc made possible the differentiation of the primary type. The author recalls the contributions of the earlier ophthalmologists, especially Graefe and Wecker, and discusses the rationale of iridectomy and the filtration operations and the theories of intraocular hypertension. Among etiologic factors considered are intraocular vascular changes, general blood pressure, the sympathetic nervous system, glandular dysfunction, sclerosis of the trabeculum, and thickening of the pectinate ligament.

J. Hewitt Judd.

Kupuscinski, W. **Influencing ocular tension in the glaucoma of youth.** Graefe's Arch., 1938, v. 138, pt. 5, pp. 673-685.

The author divides glaucoma into (1) that of childhood or hydrophthalmos, (2) that of youth, and (3) that of adults. The glaucoma of youth can be divided into (a) simple glaucoma resembling that of the adult and attended by no enlargment of the eyeball, and (b) hydrophthalmos carried over from childhood or developing first in youth. In normal eyes of children between eight and fourteen years of age first pilocarpine and then atropine was instilled, without producing any difference in intraocular tension. In five eyes with hydrophthalmos in three children, the tension diminished after the use of atropine. A twelve-year old boy presented an extensive nevus flammeus on principally the upper left side of the face. In the left eye, with a deep anterior chamber and intraocular tension varying between 45 and 39 mm. Hg, 2-percent pilocarpine had little effect, and atropine was then tried. At once the tension dropped to 12 mm. with a widely dilated pupil. This effect however was only transient and thereafter atropine caused but slight results. In a twenty-year-old girl with bilateral simple glaucoma, cyclodialysis was performed five times in each eye, with in addition trephining according to Sallmann five times in the right, and trephining and cyclodialysis according to Sallmann twice in the left eye. The tension was finally normal. Later an acute attack of glaucoma in the left eye with very deep anterior chamber was completely controlled with one percent atropine.

H. D. Lamb.

Lagrange, Felix. **Combined iridectomy and sclerectomy in the treatment of chronic glaucoma. New process for establishing the filtrating cicatrix.** Ann. d'Ocul., 1938, v. 175, Jan., pp. 67-76. (See Section 18, Hygiene, sociology, education, and history.)

Redslob, M.-E. **The discovery by L. Laqueur of the antiglaucomatous action of eserine.** Ann. d'Ocul., 1938, v. 175, Jan., pp. 81-88. (See Section 18.

Hygiene, sociology, education, and history.)

Roll, Johannes. **On quantitative perimetry in glaucoma in the dark room with objects of graduated luminosity.** Klin, M. f. Augenh., 1938, v. 100, April, p. 600.

The method gives a good picture of the function of the retinal periphery in chronic glaucoma. C. Zimmermann.

Ziporkes, Joseph. **A modification of the iridencleisis technique.** Arch. of Ophth., 1938, v. 19, April, pp. 583-584.

Two meridional cuts are made, one on either side of the forceps, to obtain easier eversion of the tongue of iris and less disturbance of the pigment epithelium, and to avoid a drawn-up pupil.

J. Hewitt Judd.

9

CRYSTALLINE LENS

Appleman, L. F. **Intracapsular cataract extraction.** Arch. of Ophth., 1938, v. 19, April, pp. 548-554.

This report includes a description of the author's technique and the results obtained in a third series of cases, including 268 from the wards of the Wills Hospital and 72 from private practice. Because of the smoothness and rapidity of convalescence, the absence of reaction, and the visual results obtained, the intracapsular is the method of choice in cases in which there are no complications. In this series 70.7 percent of the ward patients and 87.5 percent of the private patients obtained vision of 6/12 or better. The complications encountered are listed. (Discussion.) J. Hewitt Judd.

Blaess, M. J. **Removal of cataract by aspiration.** Arch. of Ophth., 1938, v. 19, June, pp. 902-911.

A series of 37 cases of soft cataract is reported in which an aspiration technique was used. A discission of the anterior capsule is first done and several days later the cortical material is aspirated by oral suction. The technique is described in detail and the results in the 37 cases are given

T. E. Sanders.

Davis, F. A. **Personal experiences with intracapsular cataract extractions.** Arch. of Ophth., 1938, v. 19, June, pp. 867-881; also Trans. Amer. Acad. Ophth. and Otolaryng., 1937, 42nd mtg., p. 218.

The author reports a series of two hundred consecutive intracapsular cataract extractions performed by the combined forceps and expression technique. The procedure is described in detail and statistical analysis of the results is given. T. E. Sanders.

Givner, I., and Gannon, C. F. **Magnesium content of capsulated lenses.** Arch. of Ophth., 1938, v. 19, June, pp. 941-946.

The blood serum and lenses of normals compared with the blood and lenses of patients with cataract showed no appreciable difference in magnesium content. The amount of magnesium in the capsule and adherent cortex is greater than in the nucleus. Rats given magnesium had a higher content of magnesium in the lens than control animals. T. E. Sanders.

Hawley, E. E., and Pearson, O. **Vitamin C and its relation to cataract.** Arch. of Ophth. 1938, v. 19, June, pp. 959-967.

There is a definitely decreased amount of cevitamic acid in the cataractous lens, from a normal of 30 mg. to 10 mg. per one hundred gm. with a decrease in the urine but the blood re-

maining normal. No correlation was found between the type of opacity and the level of vitamin C. Dietary histories indicate a lowered vitamin-C intake in the old-age group. T. E. Sanders.

Mattos, W. B. **My present technique in Barraquer's "phacoëresis."** Rev. de Oft. de São Paulo, 1938, v. 6, Jan.-Feb.-March, pp. 17-24. (See Amer. Jour. Ophth., 1938, v. 21, March, p. 332.)

Salit, P. W. **Water content and solids of cataractous and sclerosed human lenses.** Amer. Jour. Ophth., 1938, v. 21, July, pp. 755-762.

Seefried, Johannes. **The content of vitamin C in patients with senile cataract.** Graefe's Arch., 1938, v. 138, pt. 5, pp. 620-632.

There were examined 44 patients with cataract and 25 patients of about the same age without cataract but having other ocular disorders. The urine was examined for vitamin C by the method of Jezler and Kapp. It was found that the patients with cataract required more vitamin C than those without in order to be able to secrete in the urine for one day 50 percent of the amount of the vitamin C administered by mouth early on that day. This disturbance in the metabolism of vitamin C in the entire body, as well as that demonstrated for the lens of patients with senile cataract, must be suspected as a predisposing factor if not the etiologic one in the formation of senile cataract. H. D. Lamb.

Süllmann, H., and Weekers, R. **On the origin of galactose cataract.** Zeit. f. Augenh., 1938, v. 95, May, p. 58.

Rats fed with galactose develop polydipsia and polyuria, which are ascribed to the development of hypertonic tissue fluid. The change in osmotic pressure is thought to be essential in the development of galactose cataract rather than direct toxic action. The feeding of several other carbohydrates—sorbose, sorbite, and glycerine—as well as subcutaneous injection of glycerolaldehyde, was not followed by lenticular opacities. F. Herbert Haessler.

Tupinamba, Jacques. **Spontaneous luxation of both lenses into the anterior chamber.** Rev. de Oft. de São Paulo, 1938, v. 6, Jan.-Feb.-March, pp. 13-16.

In a woman of 48 years, the lens was removed surgically, without loss of vitreous, about two months after spontaneous dislocation into the anterior chamber. A week after this operation, and while the patient was still in the hospital, spontaneous dislocation occurred in the left eye. This also was operated upon successfully.

W. H. Crisp.

10

RETINA AND VITREOUS

Barkan, H., and Gray, H. **Diabetes and retinitis.** Trans. Amer Ophth. Soc., 1937, v. 35, p. 80.

The authors attempted to analyze data, both their own and those in the literature, on diabetic retinitis with a view to condensing and classifying the conflicting terminology and establishing the characteristics of a true retinitis. Certain desiderata for future studies and tabulations are also listed.

David Harrington.

Böck, Joseph. **Clinical and anatomical observations on angioid streaks in the fundus.** Zeit. f. Augenh., 1938, v. 95, May, p. 1.

In this fifty-page monograph Böck describes in detail the characteristics of

angioid streaks as recorded in the literature (over one hundred cases) and adds seven of his own. One of his patients came to autopsy and the present detailed histologic description of eyes that had been carefully studied clinically is the first to be recorded. All of the author's patients also had pseudoxanthoma elasticum.

The most important histologic findings in the eye were the changes in the lamina vitrea of the choroid, consisting of dehiscences, diffuse and local thickening, modified reaction to staining, and calcification. Reconstruction from serial sections demonstrated that the dehiscences corresponded to angioid streaks. Over the small defects, the pigment epithelium might be entirely normal, and the choriocapillaris was also normal here. Under larger defects the choriocapillaris was replaced by a tissue rich in fibers and poor in cells, with numerous very minute new-formed blood vessels. Sometimes a vascular tissue proliferated from the altered choroid through a defect in the lamina vitrea and formed a disciform plaque. The changes in the lamina vitrea, with their sequelae in the choroid, were probably the anatomic substratum for the angioid streaks and their accompanying manifestations. Only when the pigment epithelium became involved did the changes beneath become ophthalmoscopically visible.

In the author's patient, the extraocular ciliary vessels and the aorta had extensive destruction of the elastic lamella, forming a hitherto undescribed lesion. Böck believes we are dealing with a general lesion which might be called elastosis dystrophica and whose earliest manifestations appear in the eye and the skin

F. Herbert Haessler.

Bonnet, P., Paufique, L., and Bonamour, G. **Changes in ophthalmoscopic appearance and prognostic value of the sign, "thrombosis in miniature," seen in arterial hypertension.** Bull. Soc. d'Opht. de Paris, 1937, Jan., pp. 43-45.

Concerns observations on small hemorrhages from peripheral retinal vessels. When small discrete hemorrhages occur proximal to arteriovenous crossings a subsequent thrombosis of the artery is seen to develop. This is evidenced later by the brilliant reflex of the sclerosed vessel sheath at this point. The authors term this small hemorrhage, "pre-thrombosis." (4 references.) Harmon Brunner.

Brasil do Amaral, N. M. **Results obtained in the surgical treatment of retinal detachment.** Trabalhos do Primeiro Congresso Brasileiro de Ophth., São Paulo, 1936, v. 1, pp. 101-102.

The author discusses especially the techniques of Gonin, Safar, and Walker. The advantages of electrocoagulation methods over the original technique of Gonin are briefly enumerated. Sixteen cases have been operated upon by the author, nine according to Gonin's technique and seven by Safar's perforating electrocoagulation method. Five operated upon by Gonin's and four by Safar's technique were successful, the others were failures.

Ramon Castroviejo.

Caeiro, J. A. **Results of stellectomy in the treatment of pigmentary retinitis.** Arch. of Ophth., 1938, v. 19, March, pp. 378-393.

The author reviews the literature and discusses the etiologic basis for sympathectomy, the election of the place and side for the resection, and the ocular and general modifications resulting

from stellectomy. The opinion is expressed that many of the cases reported cannot be considered because the operation was not properly performed. The author's cases are divided into two series. The first consists of thirteen patients operated on without consideration of the stage of the disease, some being practically blind. Of these, four had great increase in the visual field and acuity, and one had marked temporary improvement but lost almost all that had been gained within six months. In four patients only slight improvement in acuity was obtained and in the remaining four there was no change. The second series of four cases, reported in detail, is composed of patients selected because the disease was not very advanced or at least their acuity was sufficient for useful sight, and very satisfactory results were obtained in each instance.

J. Hewitt Judd.

Duc, Camillo. **Experimental treatment of retinal detachment by fulguration.** Rassegna Ital. d'Ottal. 1938, v. 7, Jan.-Feb., p. 121.

The author conducted a series of experiments on rabbits in the hope of finding a better treatment for retinal detachment. He points out the great difficulty of producing detachment in animals. He fulgurated the sclera at the site of detachment (or its attempted site) and studied the enucleated eyes. There seems to be nothing promising in the work to date.

Eugene M. Blake.

Geserick, Heinz. **Contribution to the knowledge of endangiitis obliterans (based particularly on observations in the eye).** Graefe's Arch., 1938, v. 138, pt. 5, pp. 647-657.

In both eyes of a 41-year-old man, since he was 26 years old, there had recurred hemorrhages, followed each time by more or less complete recovery. All tests and examinations for tuberculosis were negative. At 41 years, examination of the fundi showed bilateral optic atrophy. The thread-like retinal arteries were in part changed into white strings, the veins attenuated and focally constricted. Chorioretinal foci were present close to the vessels. This fundus appearance corresponds in no wise to the picture of a completed tuberculous periphlebitis of the retina. Wassermann tests of the blood and of the cerebrospinal fluid were negative. The blood pressure was normal, being 125/80 mm. Hg. The pulse in the dorsal artery could not be felt in either foot. Neurologic symptoms had led to the diagnosis of multiple sclerosis. The cause of all the patient's general and ocular findings was endangiitis obliterans.

H. D. Lamb.

Holmin, N., and Ploman, K. G. **Thrombosis of central vein of retina treated with heparin.** Lancet, 1938, v. 234, March 19, p. 664.

The authors present the case of a 52-year-old lady who, without apparent reason, developed thrombosis of one of the veins of the right retina. She was treated with heparin, three or four doses daily, to 1.66 mg. per kg. body-weight per dose. In the course of a month the eye was very much improved and vision had improved from 0.2 at the beginning to 0.9 one month later. The authors feel quite certain that the heparin had a favorable influence. The drug is supposed to act by preventing further coagulation, thus allowing the fibrin already present to retract and consequently permit the blood to flow more easily past the thrombosis.

Ralph W. Danielson.

Lijo Pavia, J. **Retina, formation of folds by pressure on the eyeball by an orbital tumor.** La Semana Med., 1938, v. 45, May 19, pp. 1110-1116. (See Section 15, Tumors.)

Meyer, G. **Concerning the occurrence, form, and position of retinal tears in detachments at the Zurich Eye Clinic from 1928 to 1936.** Schweiz. med. Woch., 1938, April 23, p. 422.

The author tabulates cases of retinal tears; 105 cases from the eye clinic and 129 from Vogt's private practice. The percentage of tears increases with increase in degree of myopia. Tears occur more often above and temporal, preferring the peripheral areas. Tears are seldom seen in the intermediate zone between the macula and 5 d.d. from the ora. In most cases the tear is a result of cystoid degeneration. The most common forms of holes are the horseshoe, the cystoid, and disinsertion. The macular hole is limited in position. Of the 234 cases, 65.1 percent were myopic, 11.1 percent hyperopic, 21.5 percent emmetropic, and 2.2 percent aphakic.. Theodore M. Shapira.

Schultz, J. F., and O'Brien, C. S. **Retinal changes in hypertensive toxemia of pregnancy.** Amer. Jour. Ophth., 1938, v. 21, July, pp. 767-774.

Sédan, Jean. **Retinal hemorrhages occurring in hypertensive patients during airplane flights.** Ann. d'Ocul., 1938, v. 175, April, pp. 307-315.

Two cases are reported in which severe retinal hemorrhages occurred during rapid airplane ascents to from 3,000 to 4,000 meters. The literature on general physiology at high altitudes is briefly reviewed.

John M. McLean.

Shapira, T. M. **Cyanosis retinae.** Amer. Jour. Ophth., 1938, v. 21, July, pp. 781-783.

Werncke, Th. **On familial amaurotic idiocy of Tay-Sachs,** Klin. M. f. Augenh., 1938, v. 100, May, p. 665.

Werncke reports clinical and pathologic observations on four children affected with amaurotic idiocy, with fatal outcome. He draws a distinction between the Tay-Sachs type and other mostly infantile familial idiocies. Children of exclusively Jewish descent become affected in the sixth month of life, at first are otherwise normal, then degenerate, become apathetic with rigid idiotic facial expression, and at the age of two years die of marasmus or intercurrent diseases, mostly bronchopneumonia. The ophthalmoscope shows atrophy of the optic nerves, a bluish white area at the macula, and a cherry red spot in the fovea. Anatomically atrophy of the optic nerve and edema of the retina, especially the outer layers, changes of the ganglion cells, slight pigment disintegration between pigment layer and rods and cones, but no pigment migration or pigment degeneration of the retina were found.

C. Zimmermann.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Albrich, K., and Kukan, F. **On blood pressure and intraocular pressure of the eye, also a contribution to the pathology of tabetic atrophy of the optic nerve.** Klin. M. f. Augenh., 1938, v. 100, April, p. 545.

Sobanski (see Amer. Jour. Opth., 1936, v. 19, p. 818) and Lauber (see Amer. Jour. Ophth., 1936, v. 19, p. 74) deny the specificity of tabetic atrophy

of the optic nerve and attribute its etiology to low blood pressure, by which such a disproportion between intraocular and retinal arterial pressure arises that the nutrition of the retina becomes insufficient and atrophy of the optic nerve ensues. This is contested by the authors' own investigations, which are discussed in detail. They revealed the same values of general and local pressures in tabes with atrophy of the optic nerve as often in other patients and healthy persons.

C. Zimmermann.

Duggan, W. F. **Treatment of tobacco amblyopia with vasodilators.** Jour Amer. Med. Assoc., 1937, v. 109, Oct. 23, p. 1354.

In cases of tobacco amblyopia without optic atrophy, the visual improvement resulting from intramuscular injections of acetylcholine chloride roughly paralleled that obtained with intravenous injections of sodium nitrite. Visual improvement was more rapid in patients treated with sodium nitrite. It is the author's opinion that the vasodilating effect of sodium nitrite is more prolonged than that of acetylcholine. In any event, cases of tobacco amblyopia without optic atrophy do very much better under treatment with either of these drugs administered parenterally than without any treatment at all. This fact would indicate that tobacco amblyopia is due primarily to vascular spasm in the visual pathway.

George H. Stine.

Marback, H. C. P. **Contribution to radiographic study of the optic foramen.** Trabalhos do Primeiro Congresso Brasileiro de Ophth., São Paulo, 1936, v. 1, pp. 97-98.

The author has slightly modified the radiographic technique of Camp and Gianturco for the study of the optic foramen. A number of radiographs by the author, using his modification of the Camp-Gianturco method, are included. The author is not ready to offer any definite conclusion until more material is available.

Ramon Castroviejo.

Swab, C. M. **Encephalitic optic neuritis and atrophy due to mumps.** Arch. of Ophth., 1938, v. 19, June, pp. 926-929.

A case of optic neuritis and postneuritic atrophy associated with encephalitis secondary to mumps is reported.

T. E. Sanders.

12

VISUAL TRACTS AND CENTERS

Alajouanine, T., and Morax, P. V. **The tonic pupil and Adie's syndrome.** Ann. d'Ocul., 1938, v. 175, April, pp. 277-307. (And see Amer. Jour. Ophth., 1938, v. 21, July, p. 807.)

The tonic pupil has many points of differentiation from and similarity to the "true" Argyll Robertson pupil. The pharmacodynamic tests serve to separate these two conditions very conveniently. The Argyll Robertson pupil reacts poorly and slowly to mydriatics and miotics, while the tonic pupil reacts unusually well. The various arguments as to the site of the lesion are reviewed: in the ciliary nerves or ganglion, high in the medulla, in the oculomotor nucleus, in the iris, or in the supranuclear regions.

Treatment varies according to the supposed etiology. Antisyphilitic treatment is used only when other signs of syphilis can be demonstrated in addition to the pupillary manifestations. No local treatment avails.

John M. McLean.

Elsberg, C. A., and Spotnitz, H. **Value of quantitative visual tests for localization of supratentorial tumors of the brain.** Preliminary report. Bull. Neurol. Inst. of New York, 1937, v. 6, Dec., pp. 411-420.

The authors believe that dark adaptation is basically a central process. In a study of nineteen proved cases of supratentorial tumor, they find that in lesions of one hemisphere the time required for dark adaptation of the eye of the opposite side is longer than for that of the homolateral side, and that if the tumor is in or near the frontal lobe the time required for dark adaptation of the eye on the same side after exposure to a flickering light is longer than the time after a continuous light. They conclude that localization by visual tests is a procedure of definite clinical value. T. E. Sanders.

Gallenga, Riccardo. **The ocular component of neuromyelitis optica.** Rassegna Ital. d'Ottal., 1938, v. 7, Jan.-Feb., p. 39.

Neuromyelitis optica is a disease marked by evolution of a bilateral optic neuritis and a concomitant paraplegia, which presents the picture of a transverse myelitis. The author describes the occurrence of a case in a 24-year-old man, with negative family and antecedent history. Symptoms began with loss of sphincter control and this was followed in a few days by severe pain in the legs and the sensation of formication in the fingers of the right hand. At this time the ocular examination was negative. Fifteen days after the onset vision decreased markedly and it was soon reduced to light perception. On the 27th day blurring of disc margins was noted and distention of veins. A definite optic neuritis soon followed. The patient died at the end of three months, the eyes showing a postneuritic atrophy. Autopsy revealed a long focus of demyelinization particularly marked at the seventh dorsal segment, where it became necrotic. The process extended both upward and downward. A beautifully illustrated description of the pathologic changes follows. (15 figures, 4 in color.)

Eugene M. Blake.

Mittelstrass, H. **Ocular difficulties as a result of severe anemia following abortion.** Deut. med. Woch., 1938, June 24, p. 936.

As a result of an incomplete self-induced abortion which lasted at least ten days before the woman sought medical care, visual acuity in the right eye was of large objects only and in the left eye amaurosis. After several days of general medical and gynecologic treatment, a curettage was done followed by a blood transfusion of 600 c.c. Four days later a second transfusion of the same amount of blood was given. After one month the right fields were normal, the left showed a tubular field, and vision in the right eye was 1.0. The author is undecided whether the retinal injury was due to the severe ischemia or to autointoxication.

Theodore M. Shapira.

Scheyhing, H. **Isolated paralysis of the near vision center after basal skull fracture.** Zeit. f. Augenh., 1938, v. 94, April, p. 315.

In a 36-year-old woman who suffered a basal skull fracture, an isolated total paralysis of convergence, of accommodation, and of the pupillary contraction associated with efforts to adjust for near range developed. The diplopia noted with distance vision is not part of the picture and is to be ascribed to a preëxisting anatomic exophoria.

Pure convergence paralysis has been frequently described, but paralysis of all functions concerned with near vision is extremely rare. The author has found only two described. The finding lends support to Behr's assumption that a cortical and a subcortical center must exist (presumably in the occipital cortex and brain stem respectively) to bring about intimate association of functions that are controlled by three separate motor nuclei.

F. Herbert Haessler.

Trumble, H. C. **Treatment of certain tumors occurring in the region of the optic chiasm.** Med. Jour. Australia, 1938, v. 1, Feb. 12, pp. 277-287.

A series of twenty cases of tumor occurring in the region of the chiasm are reported with the findings and final postoperative results.

T. E. Sanders.

13

EYEBALL AND ORBIT

Brain, W. R., and Turnbull, H. M. **Exophthalmic ophthalmoplegia.** Quarterly Jour. Med., 1938, v. 7, April, p. 293.

The authors discuss in detail the relationship between exophthalmic goiter, exophthalmic ophthalmoplegia, and myasthenia gravis. They analyze 31 examples of a syndrome characterized by exophthalmos and ophthalmoplegia, for which the name "exophthalmic ophthalmoplegia" is proposed. Exophthalmic ophthalmoplegia may arise spontaneously, in which case it is associated with general symptoms of thyrotoxicosis, usually slight. It may also occur after subtotal thyroidectomy, when the patient's basal metabolic rate is normal or subnormal. Thyrotoxicosis therefore plays no essential part in the etiology of exophthalmic ophthalmoplegia, which for this reason, and also by its age and sex incidence, is distinguished from exophthalmic goiter. The clinical features of the disorder and pathologic changes in the orbit and the thyroid glands are described, and the etiology is discussed with special reference to the role of the thyroid and of the thyrotropic hormone of the pituitary. The exophthalmos is attributed to a factor other than thyroxin, and the ophthalmoplegia to the mechanical effect of the intraorbital tension upon the ocular muscles. Exophthalmic ophthalmoplegia is thus differentiated from the thyrotoxic myopathies and from myasthenia gravis complicating exophthalmic goiter.

Ralph W. Danielson.

Friedenwald, J. S., and McKee, C. M. **Filter-passing agent as a cause of endophthalmitis.** Amer. Jour. Ophth., 1938, v. 21, July, pp. 723-737; also Trans. Amer. Acad. Ophth. and Otolaryng., 1937, 42 mtg., p. 191.

Gurdjian, E. S. **Packing of internal carotid artery with muscle in treatment of carotid-cavernous arteriovenous aneurysm.** Arch. of Ophth., 1938, v. 19, June, pp. 936-940.

A case of carotid-cavernous arteriovenous aneurysm successfully treated by packing the internal carotid artery with a long strip of muscle removed from the sternomastoid is reported. This is supposed to be more efficient than mere ligation, as a less extensive clot is needed. T. E. Sanders.

Marine, Davis. **Effect of androgens on exophthalmos in rabbits.** Proc. Soc. Exper. Biol. and Med., 1938, v. 38, April, p. 353.

The data here reported indicate that thyroid insufficiency associated with

increased pituitary and androgenic activity (active or passive) is an important factor favoring the development of exophthalmos in rabbits. The androgenic factor is believed to play a part in the percentage increase in incidence of post-thyroidectomy exophthalmos in Graves's disease in males.

Ralph W. Danielson.

Sherne, J. **Dislocation of the eyeball as a complication of oxycephaly.** Brit. Med. Jour., 1938, March 12, p. 565.

A case of spontaneous dislocation of the left eye is reported in a child of two years with oxycephaly. The eye was replaced, but with permanent damage. Recurrence has been prevented by a lateral tarsorrhaphy.

T. E. Sanders.

Siotto, Giovanni. **Suppurating echinococcus cyst of the orbit.** Rassegna Ital. d'Ottal., 1938, v. 7, Jan.-Feb., p. 70.

The orbit is invaded in 0.8 to 1 percent of cases of echinococcus cyst. The author's patient was a woman of 29 years whose right eye had been growing progessively prominent for a year. Marked inflammatory signs were present in the orbit. There was an eosinophilia of 4 percent. Aspiration of the swelling showed greenish pus with hooklets and scolices of the echinococcus. The patient recovered.

Eugene M. Blake.

Szolnoky, Z. **Associations between exophthalmos and the nasal sinuses.** Zeit. f. Hals, Nasen, u. Ohrenheilk., 1938, v, 43, no. 2, p. 215.

After reviewing the classification of exophthalmos, the author emphasizes the part that the mucocele plays in the production of unilateral exophthalmos. He reports the case of a 64-year-old woman who had had a cataract removed sixteen years previously. The oculist had told her at that time that there was something wrong also with the non-cataractous eye. Since then the bulb had slowly become proptosed, and the vision has decreased to the point of amaurosis. Because of pain she sought relief at the surgical clinic in Budapest. At operation (after X-ray diagnosis) an enormous swelling was found which when removed gave up 200 c.c. of fluid content. A resection of the lower wall of the orbit was necessary to get at the mass. It was necessary later to enucleate the globe. The diagnosis was of a slowly developing frontal mucocele.

Theodore M. Shapira.

Tita, Carlo. **A case of tower skull with unilateral exophthalmos.** Boll. d'Ocul., 1937, v. 16, Nov., pp. 1146-1153.

A girl of seven years, otherwise normally developed somatically and mentally, showed a typical tower skull combined with a high degree of dolichocephaly and left exophthalmos. Beside the usual changes in some cranial sutures, repeated radiographies showed asymmetric orbital roofs, the left being somewhat flat, with the orbit smaller, and consequent protrusion of the eyeball. The writer is in favor of the theory that adenoidism, with affections of the nasopharyngeal cavity determining a local osteomeningitis, causes the synostosis. (Bibliography, 5 figures.)

M. Lombardo.

Walker, Sidney, Jr. **Prognosis of Bacillus welchii panophthalmitis.** Arch. of Ophth., 1938, v. 19, March, pp. 406-408.

The twelve cases previously reported in the literature are briefly reviewed and a second case reported by the

author. This comparatively rare condition apparently does not have the grave prognosis that B. welchii infection has in other parts of the body as no fatalities have been recorded. Early diagnosis, which is very important, can be made by the coffee-ground discharge from the wound and the formation of gas bubbles, even without laboratory findings. J. Hewitt Judd.

14

EYELIDS AND LACRIMAL APPARATUS

Brunner, Hans. **Roentgenologic demonstration of the region of the lacrimal sac; and the technique of endonasal operation of the sac.** Klin. M. f. Augenh., 1938, v. 100, May, p. 729.

The author reports his experiences gained in five years on the preoperative and postoperative diagnosis of dacryocystitis to which he added the endonasal roentgen examination, and the technique of operation according to Polyak-West with the modification by Kofler. Admitting the importance of a large bone window, Brunner attributes relapses chiefly to the soft parts, from which may arise intense granulation with even metaplastic bone development. Granulations may be arrested by application of alcohol. (Illustrations.) C. Zimmermann.

Orzalesi, Francesco. **A case of polyp of the lacrimal sac.** Boll. d'Ocul., 1937, v. 16, Nov., pp. 1093-1100.

The right lacrimal sac was extirpated because it was the seat of a chronic mucopurulent inflammation. It contained a neoplasm having the shape of a bean, hard, pinkish in color, and connected by a thin pedicle with the sac wall. Its histological composition is described in detail and the conclusion reached that it was a connective tissue growth of an inflammatory type. (Bibliography, 4 figures.)

M. Lombardo.

Zarzycki, Pierre. **Lacrodacryocystostomy.** Bull. Soc. d'Opht. de Paris, 1937, Jan., pp. 9-12.

Description of an operation to relieve obstruction of the lacrimal canaliculi. Both canaliculi are slit as far as the lacrimal sac, and a new sinus connecting the lacrimal sac and the conjunctival sac is formed. It is lined with a sliding graft of conjunctiva. The results on the demonstrated cases were perfect functionally and cosmetically. It is similar to the procedure described by Hoffman (see Trans. Tenth Internat. Congress, 1904, p. B 41).

Harmon Brunner.

15

TUMORS

Birge, H. L. **Cancer of the eyelids. 1. Basal cell and mixed basal cell and squamous cell epithelioma.** Arch. of Ophth., 1938, v. 19, May, pp. 700-708.

A series of 230 cases of cutaneous cancer of the eyelid were examined and graded histologically. About 60 percent were basal-cell epitheliomas and 14 percent mixed basal-cell and squamous-cell epitheliomas. The mortality rate of the basal-cell epitheliomas was 11 percent, with 46.1 percent living fifteen or more years after treatment, while in the mixed basal-cell and squamous-cell type the mortality was 6.8 percent, with 75 percent living fifteen years. In each group blindness resulted in about 25 percent of the cases. The basal-cell type was more malignant than either the mixed type or the squamous-cell epithelioma. T. E. Sanders.

Czukrász, Ida. **Sarcoma of the lacrimal fossa simulating a tumor of the tear**

sac. Klin. M. f. Augenh., 1938, v. 100, May, p. 724.

A woman of 54 years showed at the right medial angle a tumor which opened spontaneously with evacuation of abundant pus. At the extirpation of the lacrimal sac the thin posterior wall of the enlarged sac was bulged by a soft tumor connected with it. The tear sac was removed with the tumor in toto. The latter was a relatively benign periosteal fibrosarcoma of the lacrimal fossa. The wound healed by first intention. Roentgen rays were applied for a few days after operation. The patient showed no distressing symptoms after six years. (Illustration.)

C. Zimmermann.

Favaloro, G. **The glial and spongioblastic genesis of retinal tumor.** Klin. M. f. Augenh., 1938, v. 100, April, p. 577.

According to reports in the literature and Favaloro's own investigations retinal tumors may be classed in two great groups, gliomas and neuroblastomas. Six different zone types of glioma are described. C. Zimmermann.

King, E. F. **The classification of the ocular melanomata.** Trans. Ophth. Soc. United Kingdom, 1937, v. 57, pt. 2, p. 557.

The classification of melanomata according to the type of cell and the content of the reticulum or argyrophile fibers according to Callender and Wilder (see Amer. Jour. Ophth., 1936, v. 19, p. 632.) is given, and is elucidated with illustrations. The observations of those authors are supported by careful study of thirty cases. The prognosis varied according to the reticulum content. As Callender and Wilder concluded, so the author corroborates from his small series that the diffuse presence of reticulum is of good prognostic significance. Of those cases that had some areas with and some without fibrils, a large percentage showed metastasis within five years.

Beulah Cushman.

Lijo Pavia, J. **Retina, formation of folds by pressure on the eyeball by an orbital tumor.** La Semana Med., 1938, v. 45, May 19, pp. 1110-1116.

The patient was a woman of 25 years, the tumor an encapsulated hemangioendothelioma which pushed the eyeball downward. There were numerous retinal folds, some running across the macula. W. H. Crisp.

Reese, A. B. **Precancerous melanosis and diffuse malignant melanoma of the conjunctiva.** Arch. of Ophth., 1938, v. 19, March, pp. 354-365; also Trans. Amer. Ophth. Soc., 1937, v. 35, p. 45.

Eight cases are reported illustrating the fact that a precancerous melanosis may occur in the conjunctiva and may be the forerunner of a diffuse malignant melanoma. The opinion is expressed that these tumors arise primarily from the potentially pigment-bearing basal layer of the conjunctiva. The average age at which precancerous melanosis was recognized was about 48 years and the average interval before malignant changes ensued was about five years. The characteristic diffuseness of the lesion, its relations to nevus and trauma, the signs of growth, the possibility of spontaneous regression, and treatment are discussed. (Colored plate, photomicrograph.

J. Hewitt Judd.

Rintelen, F. **The differential diagnosis of choroidal sarcoma.** Zeit. f. Augenh., 1938, v. 94, April, p. 320.

In 1923 Meissner suggested micro-

scopic examination of puncture fluid for tumor cells when choroidal sarcoma is suspected. In such eyes he found tumor cells five times. In four of them the diagnosis was confirmed by study of the enucleated eye, and in one eye in which no tumor cells were found the retina became reattached after puncture.

In order to emphasize the importance of the procedure, the author describes the clinical course of two patients in whom he found this diagnostic measure useful. F. Herbert Haessler.

Robinson, G. A. **Cancer of eyelids.** Amer. Jour. Roentgenology and Radium Therapy, 1937, v. 38, Nov., p. 743.

A summary of two hundred cases is given. The condition is as common in the female as the male. Primary cancer of the lower lid is nearly nine times as common as that of the upper lid. Most cancers of the lower lid are of the basal-cell variety and are of low grade malignancy.

Electro-desiccation followed by radium applications is probably the treatment of choice in early cases. Interstitial radium therapy using needles or gold-radon implants its better than surface-radium or X-ray therapy. Recurrences after surgical extirpation of the lesions are frequent. Enucleation is indicated in extensive orbital involvement. F. M. Crage.

Schreck, Eugen. **An oligodendroglioma as contribution to the primary intradural tumors of the optic nerve.** Klin. M. f. Augenh., 1938, v. 100, April p. 560.

A girl of 10 years showed slow but constantly increasing left exophthalmos with loss of vision. By Krönlein's method a smooth dark tough tumor the size of a walnut encircling the optic nerve was exposed and enucleated with the eye. The anatomical description is given in detail. The tumor was identified as an oligodendroglioma which had started from the glia of the nerve stem, had infiltrated the pia, and had spread in the intervaginal space. (Illustrations.) C. Zimmermann.

Sgrosso, S. **Glioma of the optic nerve.** Rassegna Ital. d'Ottal., 1938, v. 7, Jan.-Feb., p. 1.

In this voluminous article the author reports a case of glioma of the optic nerve arising in a seven-year-old girl. There was 12-mm. exophthalmos and the eye was directed up and in. The tumor was excised through a Krönlein incision, leaving the globe in place. There was no recurrence in three years and no evidence of extension backward or of metastasis. There follows a minute discussion of symptomatology of orbital tumors and, in particular, of the histogenesis of glioma. (7 figures) Eugene M. Blake.

Stallard, H. B. **Cavernous hemangioma of the orbit successfully removed by Krönlein's operation.** The Lancet, 1938, v. 234, Jan. 15, p. 131.

A neoplasm measuring 2.5 by 2.1 by 2.1 cm. was removed from within the cone formed by the recti muscles, without damage to the central retinal vessels or to the optic nerve. The vision prior to operation was counting fingers at one meter. One month after operation this had improved to 6/9.

Edna M. Reynolds.

16

INJURIES

Blobner, Ferdinand. **Discoloration of the cornea by an adrenalin preparation.** Klin. M. f. Augenh., 1938, v. 100, May, p. 758.

A man of 77 years with entropion of the left lower lid had an inflammation of the left eyeball for four weeks. The eye showed intense conjunctival and pericorneal injection and an epithelial defect with grey infiltrated borders of the central and temporal portions of the cornea. After atropine the tension rose and hypopion with hyphema developed. At iridectomy much pus was evacuated. However, the process was not influenced by any treatment. On account of the hypertension glaucit salve (an adrenalin preparation) was repeatedly used. After about four weeks a brown discoloration was observed at the lower portion of the cornea, extending to the parenchyma. This area showed loss of epithelium. After the glaucit was discontinued, the epithelial defect gradually became smaller and the intensity and extent of the discoloration slowly diminished, although still marked on discharge of the patient six weeks later. The lesion and discoloration were attributed to the adrenalin content of the glaucit salve. C. Zimmermann.

Brodskii, B. S. **Uveitis caused by arsenic poisoning.** Viestnik Opht., 1937, v. 11, pt. 6, p. 898.

A bilateral chronic iridocyclitis developed in a farmer, from careless handling of an arsenic disinfectant. The diagnosis was made by finding traces of arsenic in the aqueous humor.

Ray K. Daily.

Casini, F. **Concerning a case of luxation of the lens into the vitreous.** Arch. di Ottal., 1938, v. 45, Jan.-Feb., p. 139.

The author describes a case of luxation of the lens into the vitreous with herniation of the vitreous through the pupillary space. A period of observation of over two years revealed no inflammatory reaction and no increase in intraocular tension. H. D. Scarney.

Gaulejac, R. de. **Injuries from aviators' goggles.** Ann. d'Ocul., 1938, v. 175, April, pp. 315-319.

Serious ocular or orbital injuries may be sustained by aviators wearing glasses or goggles with metal parts or ordinary shatterable glass. Three such cases are reported. John M. Mclean.

Goldmann, H., and Liechti, A. **Experimental observations on the genesis of the roentgen cataract.** Graefe's Arch., 1938, v. 138, pt. 5, pp. 722-736.

In three rabbits with undilated pupils, the iris and the whole lens were directly exposed to roentgen rays. Three to four months later, definite opacities occurred in all the eyes, at the anterior and posterior suture lines. (Rabbits have usually only an anterior vertical and a posterior horizontal suture line.) These opacities increased considerably in intensity in the following months and extended toward the equator. Another four rabbits, after mydriasis, had only the central part of the lens over an area 4 mm. in diameter exposed to the X rays. Not the slightest opacity could be observed in any although all the rabbits were examined for at least twelve months following the raying. A third group of four rabbits, after iridectomy, were exposed to X rays for a longer time (6 weeks, 10 weeks, 8 months), but only peripherally in the coloboma without either the iris or ciliary body lying in the field of the rays. Four months later, the same positive findings occurred as in the first group. It must therefore be concluded that the primary point of attack of the roentgen rays lies in the region of the lens equator, and that in production of roentgen cataract the iris and ciliary

body apparently play no part. The germinal epithelial cells of the lens fibers are primarily injured by the X rays. After it is injured, this epithelium still produces generations of lens fibers at whose ends opacities arise. The injured fibers become shorter and shorter from generation to generation until their formation finally stops.

H. D. Lamb.

Greeves, R. A. **Some unusual cases of glaucoma secondary to injury.** Brit. Med. Jour., 1937, Dec. 4, p. 1107.

Four cases of glaucoma as a complication of ocular injuries, two nonperforating and two perforating, are reported. In one case no symptoms of glaucoma appeared until fourteen years after the accident. In one of the other cases, the tension has remained normal for ten years, although the trephine opening closed after a few months. In another case, the tension became normal immediately after removal of a chip of steel from the eye, and remained so without further treatment. In the last case, X-ray examination showed the presence in the vitreous of a foreign body which gave no response to repeated applications of the magnet. A trephine operation successfully reduced the tension to normal.

Edna M. Reynolds.

Hubbard, W. B. **Caustic burns of the eye.** Arch. of Ophth., 1938, v. 19, June, pp. 968-975.

From experimental and clinical data, the author concludes that for emergency treatment of caustic burns of the eye water and weak acids should be used freely, the use of an alkaline neutralizing fluid being avoided. For after-treatment tannic acid, with such antiseptics as methyl rosaniline and silver nitrate, is preferred.

T. E. Sanders.

Laval, Joseph. **Necrosis of the frontal bone and of the lacrimal gland.** Arch. of Ophth., 1938, v. 18, May, pp. 762-766.

A case of necrosis of the frontal bone and of the lacrimal gland following trauma is reported. T. E. Sanders.

Medvedef, N. I. **Double perforations of the eyeball; a classification.** Arch. of Ophth., 1938, v. 19, Feb., pp. 224-228.

This study is based on 37 cases which are divided into three groups. In the first group (19 cases) the foreign body had completely perforated and was lying outside the globe, and free in the orbit. In the second group (9 cases) the foreign body was localized outside the ball but in connection with the wound of exit. In the third group (9 cases) the foreign body was fixed between the edges of the wound of exit. The prognosis is best in the first and poorest in the third group.

J. Hewitt Judd.

Monbrun, O. G. **Rhabdomyosarcoma of lids and orbit.** Bull. Soc. d'Opht. de Paris, 1937, Feb., pp. 78-91.

Detailed report of a case of sarcoma having origin in the upper lid, and containing atypical striated muscle fibers. The authors feel that if atypical fibrosarcomata were given the special stain for striations, this tumor would not be thought so rare. (Review of literature, 3 illustrations.)

Harmon Brunner.

Perera, C. A. **Epithelium in the anterior chamber of the eye after operation and injury.** Amer. Jour. Ophth., 1938, v. 21, June, pp. 605-617; also Trans. Amer. Acad. Ophth. and Otolaryng., 1937, 42nd mtg., p. 142.

Quentin, G. **Tetanus following inclusion of a foreign body in the cornea.**

Bull. Soc. Franç. d'Opht., 1938, v. 50, pp. 92-100.

The patient was a stone mason aged 55 years. There was hypopyon but no perforation of the globe. After a sixteen-day incubation period, there were trismus, flexure and contracture of the limbs, slight facial paralysis on the side of the wound, and difficulty in swallowing. The patient recovered under massive doses of antitoxin. Antitoxin should be given when the corneal wound is contaminated directly with street dirt, or indirectly by means of a foreign body. Clarence W. Rainey.

Rainey, Clarence. **Removal of large foreign body from vitreous.** Amer. Jour. Ophth., 1938, v. 21, July, pp. 780-781.

Stokes, W. H. **Retained intraocular foreign bodies.** Arch. of Ophth., 1938, v. 19, Feb., pp. 205-216.

Analysis of 300 cases supports the contention that the mere presence of a foreign body in the globe is no occasion for haste, excitement, or ill-advised removal since such bodies are often well tolerated in the anterior chamber, lens, and posterior coats of the eye. In 101 cases the foreign body was retained respectively for from one month to 35 years. Of this group, 60 suffered total and permanent loss of vision, while 22 cases, in 13 of which the foreign body was not removed, retained good vision. Retention of a foreign body in the vitreous always produced destruction of vision. In no instance did retention of a foreign body produce sympathetic inflammation, but removal did in two cases. Accurate localization should always be done before attempting extraction. Foreign bodies located in the anterior segment should be removed by the anterior route and those in the posterior segment through the sclera after applying diathermy around the area. J. Hewitt Judd.

Thies, Oskar. **Why early operation in serious burns of the eye?** Graefe's Arch., 1938, v. 138, pt. 5, pp. 686-692.

The author thinks there is no necessity to carry out exclusively either conservative or operative measures in serious burns of the eye. It is not right to conclude that an early operation must always be performed. Each physician from his own knowledge must decide in each case.

H. D. Lamb.

Wilczek, Marian. **The mechanism of the new surgical procedures for retinal detachment.** Klinika Oczna, 1937, v. 15, pt. 6, p. 676.

The author believes that the most important effect of successful surgical procedure in retinal detachment is due to cicatrization and consequent contraction and shortening of the sclera.

Ray K. Daily.

Wittels, Ludwik. **X-ray treatment of traumatic cysts of the anterior chamber.** Klinika Oczna, 1937, v. 15, pt. 6, p. 695.

A review of the literature and report of a case. The eye was injured by a shot in 1922. Fourteen years later the patient appeared with a cyst in the anterior chamber, with normal tension and vision of 3/36. He was given three X-ray treatments of 100 roentgen each, at a distance of 34 cm., with a 0.5-mm. copper and 10-mm. aluminum filter. The result was shrinking of the cyst, with clearing of the pupil and restoration of vision to 6/12. Ray K. Daily.

17
SYSTEMIC DISEASES AND PARASITES

Charlin, Carlos. **Nasal neuritis and essential neuralgia of the trigeminus.** Boll. d'Ocul., 1937, v. 16, Nov., pp. 1087-1092.

The writer reports three cases of nasal-nerve syndrome which he described in 1930. A typical case is that of a woman affected by a corneal ulcer, associated with symptoms of acute rhinitis of the anterior third of the nasal cavity and violent neuralgia of the same side. Ocular and nasal local therapy had been negative. Radiography showed evidence of ganglionic involvement, and the Mantoux test performed in the course of examination was followed by rapid disappearance of all symptoms. A woman affected by facial neuralgia rebellious to all treatments, and with an old history of tuberculosis of a foot and signs of an old pleurisy with general micropoliadenitis, recovered permanently after a Mantoux test was performed. A third patient, a man of 42 years affected by essential neuralgia of the trigeminus for more than twelve years, recovered after long treatment with tuberculin. The histories of these three patients suggest to the author that neuritis and neuralgia of the trigeminus or other nerves can be connected with a ganglionic tuberculosis, and that in such cases a tuberculin test should be tried before attempting any form of treatment. M. Lombardo.

Ezickson, W. J., and Feldman, J. B. **Signs of vitamin-A deficiency in the eye correlated with urinary lithiasis.** Jour. Amer. Med. Assoc., 1937, v. 109, Nov. 20, p. 1706.

This is a report of 25 cases of urolithiasis associated with vitamin-A deficiency which was determined by the dark adaptation test with the Feldman technique and instrument. Twenty-four of the patients were given large doses of vitamin A daily over a period of from six to nine months, and of fifteen who returned for restudy, fourteen continued to show pathologic dark adaptation, and only one showed improvement. The patients gained in general health, and there was no progression of the urolithiasis. The authors suggest the possibility that urinary lithiasis and lack of vitamin-A assimilation or utilization may have a common metabolic basis. (4 charts, case reports, discussions.) George H. Stine.

Kalashnikova, V. P. **The eye and gout.** Viestnik Opht., 1937, v. 11, pt. 6, p. 762.

Brief reports of fourteen cases of blepharitis, conjunctivitis, and keratitis meibomiana. The author believes that gout is the etiologic factor, basing his thesis on theoretic and therapeutic grounds. Ray K. Daily.

Langdon-Brown, Walter. **Hormones and vitamins in ophthalmology.** Trans. Ophth. Soc. United Kingdom, 1937, v. 57, pt. 2, p. 454.

The author reviews the literature and sums up as follows; Vitamin A is essential to the organization of the eye and to the functioning of the visual purple. Together with vitamin B2 it plays an important part in maintaining the nutrition of the ocular envelopes, while the latter is also needed for the nutrition of the optic nerve. Vitamin D and parathormone regulate blood calcium. Enlargement of the pineal or the pituitary may lead to serious pressure effects on the nervous structures, and

the thyrotropic hormone of the pituitary seems to be responsible for exophthalmos in which the secretion of the adrenal medulla also plays a part. Maintenance of the normal blood-sugar level by insulin is very important for the health of the eye.

Beulah Cushman.

Lemoine, A. N. **Ocular manifestations of endocrine disturbance.** Arch. of Ophth., 1938, v. 19, Feb., pp. 184-193; also Trans. Amer. Acad. Opthth. and Otolaryng., 1937, 42nd mtg., p. 247.

The author discusses the normal function and the signs and symptoms of dysfunction of the thyroid, parathyroid, pituitary and adrenal glands, and pancreas and gonads. Certain forms of glaucoma, cataract, myopia, and keratoconus apparently are associated with endocrine dysfunction. A sign in hypothyroidism, not previously reported, is edema of the retina around the disc and macula, extending into the retina as much as four or five disc diameters, and an elevation of the disc up to three diopters. J. Hewitt Judd.

Lommel. **Dissemination paths of tuberculosis.** Klin. M. f. Augenh., 1938, v. 100, May, p. 657.

Lommel discusses early generalization bacillemia, isolated organ tuberculosis, superinfection, endogenous metastases, exogenous superinfection, and measures against tuberculosis as epidemic. C. Zimmermann.

Mursin, A. H. **Ocular changes in herpes zoster ophthalmicus.** Viestnik Opht., 1937, v. 11, pt. 6, p. 758.

A report of three cases with involvement of the lids, cornea, abducens, optic nerve, retina, and sympathetic. Mursin regards the disease as due to a specific infection. Ray K. Daily.

Rameev, P. C. **Ocular involvement in leprosy.** Viestnik Opht., 1937, v. 11, pt. 6, p. 787.

Because of the frequent ocular complications in leprosy, the author pleads for assignment of an ophthalmologist to the medical staff of leper colonies. He points out that in the Astrakhan leper colony there are no blind people, and he attributes this to the constant availability of ophthalmologic assistance. Ray K. Daily.

Vaisberg, Maurice. **Hemolytic streptococcus septicopyemia of obscure origin.** Med. Record, 1937, v. 146, Dec. 15, p. 516.

A white male, aged 41 years, was severely beaten about the head and developed marked proptosis of the right eye which subsided in a short time. A latent jaw infection was apparently activated by the trauma, with development of a septicopyemia and numerous secondary septic foci. One of the emboli lodged in the left eye, where it simulated an acute inflammatory glaucoma. Ninety grains of sulfanilamide were given daily for six days, beginning, however, not until 48 hours after the appearance of septicemia. Large doses of antistreptococcus serum were also given, but the patient succumbed to the overwhelming infection.

Edna M. Reynolds.

Vogt, Alfred. **Further ocular studies on enzygotic twins of advanced age as to the heredity of senile stigmata.** Klin. M. f. Augenh., 1938, v. 100, April, p. 497.

Vogt demonstrates in these investigations from 1935 to 1937 the heredity of senescence in 34 single-ovum pairs of twins of from 55 to 81 years of age. He discusses in detail the senile changes of the conjunctiva (pinguecula, pteryg-

ium), cornea (gerontoxon, pigment spindle of the posterior surface), lens (different types of senile cataract), vitreous, and fundus (including drusen of the optic nerve). The identity of the senile changes of the eyes, the face, and the hair of the head in both of each pair of twins plainly shows that the senile changes of the organism and its parts depend less on the environment than on predestination in the germ plasm, enzygotic twins having identical germ plasm. The hereditary proton determines our life from birth to termination of the growth of the body, our fate at middle age, and finally the phenomena of senescence which precede and prepare for physiologic cessation of life. Medicinal and physiochemical methods against cataract, with iodine, hormones, vitamins, and so on, have not in a single case been controlled by slitlamp microscopy, so that statistics of supposed therapeutic results in cataract are valueless.

C. Zimmermann.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Black, N. M., Gradle, H. S., and Snell, A. C. **Visual standards for licensure to operate motor vehicles.** Jour. Amer. Med. Assoc., 1937, v. 109, Oct. 16, p. 61B.

This is a preliminary report containing many recommendations for examination and licensure of automobile drivers, with a view to overcoming the appalling increase in automobile accidents.

George H. Stine.

Boguslawska, Maria. **The fight on trachoma in the primary schools of Warsaw.** Klinika Oczna, 1937, v. 15, pt. 6, p. 790.

The prevalence of trachoma in the kindergartens and primary schools has diminished by 50 percent as compared with the statistics of 1934. The writer attributes this diminution to examination of all children at the time of registration. In order to make these examinations more effective he urges that a course on trachoma be made obligatory for all school physicians.

Ray K. Daily.

Chance, Burton. **Sir Hans Sloane's account of an efficacious medicine for soreness of the eyes.** Arch of Ophth., 1938, v. 19, June, pp. 912-925.

A historical account of the treatment of ophthalmia in the early eighteenth century with a complicated preparation used by Sir Hans Sloane. Included is a contemporary criticism of the method.

T. E. Sanders.

Fordonski, Alexander. **A report of the work of the antitrachomatous dispensary in Turek.** Klinika Oczna, 1938, v. 16, pt. 1, p. 134.

An official report for the Public Health Service. Ray K. Daily.

Gjessing, H. G. A. **Sören Holth.** Acta Ophth., 1938, v. 16, pt. 1, p. 1.

An obituary.

Grzedzielski, Jerzy, and Dymitrowska, Maria. **The data of ocular examinations of 2,753 high-school applicants in Lwow.** Klinika Oczna, 1938, v. 16, pt. 1, p. 50.

An inconclusive analysis of the ocular examinations of 2,753 first-year college students in Lwow, relative to sex, race, constitutional type, and error of refraction. Ray K. Daily.

Guilfoyle, W. J. Y. **Experiences of an uniocular pilot of aircraft.** Trans. Ophth. Soc. United Kingdom, 1937, v. 57, pt. 2, p. 431.

An air pilot gives his experiences in learning to land a ship after loss of an eye. At first his judgment as to distance was unreliable, so that he made bumpy landings, but looking across his nose in the direction of the eye that was lost he was able to judge distance and learned to land perfectly. Since loss of the eye he has been an instructor to instructors for twenty years.

Beulah Cushman.

Howard, W. H. **Ophthalmologic shorthand.** Arch. of Ophth., 1938. v. 19, March, pp. 403-405.

This article is a plea for standardization of ophthalmologic abbreviations to simplify clinical reports and expedite the recording of histories and findings. An incomplete list is submitted. Single letters are used whenever logical, but when two words begin with the same letter the frequency and importance of use determine which will be abbreviated with a single letter and which will receive one or more additional letters, as vision = V. and vitreous = Vit.

J. Hewitt Judd.

Hummel, Edgar. **Does iris diagnosis stand a serious test?** Klin. M. f. Augenh., 1938, v. 100, April, p. 597.

Iris diagnosis teaches that every organ of the body is represented on a certain part of the iris (about forty fields) which show change if the organ is diseased. Tests in one hundred patients with absolutely certain clinical diagnosis showed only three positive results, lying within the range of chance. This proves that the "method" is entirely valueless.

C. Zimmermann.

Jackson, Edward. **Light in the schoolroom.** Jour. Amer. Med. Assoc., 1937, v. 109, Sept. 11, p. 841.

Marked inequalities in the amount of light in different parts of even the best lighted schoolrooms were found. School authorities, architects, and financiers still have to be educated to know that good lighting is worth having in any community. George H. Stine.

Kalefa, C. **A review of the scientific contributions of Professor V. P. Filatov.** Viestnik Opht., 1937, v. 11, pt. 6, p. 747.

This paper describes the forty years of activity of Filatov as clinician, research worker, and teacher, beside his numerous contributions on ophthalmology, his participation in the academy of science, and his membership in the city soviet. It lists 132 ophthalmologic articles. Ray K. Daily.

Lagrange, Félix. **Combined iridectomy and sclerectomy in the treatment of chronic glaucoma. New process for establishing the filtrating cicatrix.** Ann. d'Ocul., 1938, v. 175, Jan., pp. 67-76. (Reprint of communication made to the Société Française d'Ophthalmologie in 1906.)

Included in this issue of the Annales d'Oculistique as a part of the celebration of the one-hundredth anniversary of the founding of that journal.

Livingston, P. C. **Debatable ground in the matter of the monocular and uniocular pilot of aircraft.** Trans. Ophth. Soc. United Kingdom, 1937, v. 57, pt. 2, p. 434.

The monocular pilot is considered as possessing two eyes, but using only one for actual handling of the aircraft. A comparison of charts of angular stereopsis tests made with normal binocular vision, and those made for monocular and uniocular pilots, is given, to indicate the hazards that must be overcome

by the different types of pilot or if the vision of one eye becomes affected at any time. Beulah Cushman.

Malinowski, Tadeusz. **The fight on trachoma in the Lodz district.** Klinika Oczna, 1938, v. 16, pt. 2, p. 269.

A detailed administrative report.
Ray K. Daily.

Meyer, F. W. **Contribution to the heredopathology of the eye in its relation to general hereditary pathology.** Klin. M. f. Augenh., 1938, v. 100, May, p. 753.

Meyer shows in several cases the coincidence of hereditary ocular affections such as coloboma of iris choroid and optic nerve, microphthalmos, macular degeneration, zonular and nuclear cataract, lens dislocation, and retinitis pigmentosa, with other bodily or mental defects. It is less important to find diseased single individuals than the hereditary diseased tribe. In retinitis pigmentosa sterilization is indicated only if familial occurrence is proved. C. Zimmermann.

Nuel. **Vision.** Ann. d'Ocul., 1938, v. 175, Jan., pp. 77-80. (Reprint of review by Parinaud published in Annales d'Oculistique in 1904.)

This review of Nuel's book is included in this issue of Annales d'Oculistique as a part of the celebration of the one-hundredth anniversary of the founding of that journal.

Okolov-Hrynkiewiczowa, Z. **Prophylaxis of trachoma.** Klinika Oczna, 1938, v. 16, pt. 2, p. 247.

A review of the literature and a detailed description of the work in Poland, in schools, army, dispensaries, and orphan asylums. Ray K. Daily.

Parinaud, H. **Paralysis of associated movements of the eyes.** Ann. d'Ocul., 1938, v. 175, Jan., pp. 47-66. (Reprinted from Archives de Neurologie, March, 1883.)

Included in this issue of Annales d'Oculistique as a part of the celebration of the one-hundredth anniversary of the founding of that journal.

Parker, W. R. **Some phases of postgraduate instruction in ophthalmology.** Jour. Amer. Med. Assoc., 1937, v. 109, Oct. 16, p. 1262.

There is no cause for pessimism concerning the progress of ophthalmology in this country, when one realizes the advance that has been made during the last 25 years. Probably the most important influence in this change has been the American Board of Ophthalmology, the activities of which not only have elevated the standards of clinicians but have had a most beneficial influence on the quality of teaching offered. An outstanding advance in the instruction offered in ophthalmology is manifest in the systematic courses now given to resident staffs. The rate of progress may have been slow, but there is every reason to believe that it will be greatly accelerated by the activities of the Advisory Board of Medical Specialties as sponsored by the American Medical Association.
George H. Stine.

Redslob, M. E. **The discovery by L. Laqueur of the antiglaucomatous action of eserine.** Ann. d'Ocul., 1938, v. 175, Jan., pp. 81-88.

In 1863 instillations of physostigmine were recommended in the treatment of chronic glaucoma, but with the object of contracting the pupil and not of diminishing intraocular tension. In fact, Graefe regarded the drug as in-

creasing tension by its action on accommodation. At that time the only treatment of glaucoma, either acute or chronic, was iridectomy. Up to 1876 there was still no recognition of any drug the instillation of which was capable of diminishing the tension of the glaucomatous eye, and eserine was used only as a miotic to facilitate operation for glaucoma, in the form of iridectomy or sclerotomy. The discovery by Laqueur of the hypotensive and antiglaucomatous action of eserine created a sensation. Laqueur was then Professor of Ophthalmology in the faculty of Strasbourg.

Laqueur's first essay on the subject advised the use of physostigmine in all cases of simple glaucoma and especially where the iris and the anterior chamber presented no anomalies. His experience, he said, showed that in these cases iridectomy was almost always without effect. He also advised the use of the drug in cases in which iridectomy had not diminished the tension, and in all cases of secondary glaucoma without anterior or posterior synechia. He remarked that in a case of hemorrhagic glaucoma the drug had produced no effect. In 1877 Laqueur published a paper in which he reported a brilliant result from eserine in a case of acute glaucoma. W. H. Crisp.

Rochon Duvigneaud, A. **One hundred years of Franco-Belgian ophthalmology.** Ann. d'Ocul., 1938, v. 175, Jan., pp. 11-46.

This historical account, in a special issue of Annales d'Oculistique which celebrates the one-hundredth anniversary of the founding of the journal by Florent Cunier, a Belgian military surgeon, is accompanied by splendid reproductions of portraits of Cunier, Warlomont, Desmarres, Dor, Panas, De Wecker, Gayet, Javal, Badal, Abadie, Coppez, Nuel, Parinaud, Landolt, Lagrange, Truc, and Van Duyse.

The author gives brief accounts of the lives of the various collaborators during the past one hundred years, and adds histories of the great French and Belgian clinical institutions and of the teaching of ophthalmology in Belgium and France. W. H. Crisp.

Rostkowski, Ludwik. **Appreciation of the work of the trachoma dispensaries in Poland.** Klinika Oczna, 1937, v. 15, pt. 6, p. 773.

Maps show the prevalence of trachoma in Poland, and the set-up of the antitrachomatous work. According to the statistics there are about 400,000 trachoma patients in Poland. The antitrachomatous activities coördinate the work of all the health agencies, such as the public health service, the health insurance division, the army, and the schools. The antitrachomatous dispensaries, in addition to the clinical-treatment service, have charge of school examinations, treatment in the schools and orphanages, registration of the diseased, and direction of patients to hospitals and private oculists. The writer believes that there is no increase in the prevalence of the disease.

Ray K. Daily.

Smith. **Early Missouri ophthalmologists.** Jour. Missouri State Med. Assoc., 1938, v. 35, Feb., p. 49.

The names of John Green, Charles Eugene Michel, Adolph Alt, B. E. Freyer, and Flavel B. Tiffany are linked with the progress of ophthalmology. Their literary accomplishments are enumerated. Green's contribution was that of raising the standards of ophthalmologists. Michel was known for his surgical skill. Alt started the first

American Journal of Ophthalmology in 1884 and was its editor for 34 years. Tiffany contributed largely to ophthalmic literature. F. M. Crage.

Strebel, J. **Art and eye. 5. Four-phase development in the mode of painting of a red-green-blind artist.** Klin. M. f. Augenh., 1938, v. 100, April, p. 593.

The different periods are described in detail to show that for their explanation biology is not sufficient without psychoanalysis. C. Zimmermann.

Thorne, F. H. **Ophthalmology in aviation.** Arch of Ophth., 1938, v. 19, Feb., pp. 253-277.

The requirements for the various classes of military and commercial fliers are discussed with reference to acuteness of vision, efficiency of the extraocular muscles, depth perception, color vision, reaction time, and flying goggles. J. Hewitt Judd.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Mawas, Jacques. **Notes on Tenon's capsule and its histologic significance.** Bull. Soc. d'Opht. de Paris, 1937, Feb., pp. 110-112.

Microscopic sections of an entire human orbit, fixed in celloidin, show no evidence of the Tenon's capsule as classically described. There is no capsule as a separate entity or a space between the sclera and the rest of the orbital contents. The orbit is traversed by a supporting meshwork of partitions made up of orbital connective tissue, with condensations around the larger vessels, the ciliary nerves, and the optic nerve. This meshwork is denser around the sclera, but in no way forms a capsule or sheath. Sections show globules of intraorbital fat in direct contact with the sclera. The author feels existing misconceptions have arisen through dissection methods in which each portion has been isolated in preserved cadavers, rather than studying the orbital contents in their undisturbed relationship. Two photomicrographs demonstrate the absence of a fascia and seem to disprove the current conception of Tenon's capsule as demonstrated by Whitnall and others. (2 photomicrographs.) Harmon Brunner.

NEWS ITEMS

Edited by Dr. H. Rommel Hildreth

640 South Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

Deaths

Dr. George de Schweinitz, Philadelphia, died August 22, 1938, aged 80 years.

Dr. John M. Wheeler, New York, died August 22, 1938, aged 58 years.

Dr. Frank Douglas Thinney, Cincinnati, died May 30, 1938, aged 64 years.

Dr. Edwin J. Lent, South Bend, Indiana, died May 31, 1938, aged 67 years.

Dr. Claude Spencer Beebe, Milwaukee, Wisconsin, died May 24, 1938, aged 60 years.

Dr. John G. Love, Sedalia, Missouri, died May 15, 1938, aged 61 years.

Miscellaneous

Announcements have been made of post-graduate courses in ophthalmology given by the Harvard Medical School for 1938. These courses are divided into three divisions as follows: The first division, open to general practitioners, consists in courses in the use of the ophthalmoscope and ocular complications in general disease. The second division, open to beginners, consists of one course, "Fundamental science in ophthalmology," and is devoted to the essentials of embryology, anatomy, pathology, physiological optics, physiology, chemistry, and pharmacology. The third division, for advanced students, consists of courses in all clinical subjects of ophthalmology, eye pathology, and physiological optics as well as a four-week intensive course, "Recent advances in ophthalmology," which is centered around clinical-pathological ophthalmology. It summarizes all the clinical courses.

The "Survey of eye conditions" course organized in 1932 continues to be offered by New York and Columbia Universities in cooperation with the Bureau of Services for the Blind, New York State Department of Social Welfare. Lectures by ophthalmologists and technicians cover both the medical and social aspects of eye conditions and their treatment. Recognition of the estimated value of this course is borne out by the steady increase in enrollment. Teachers, social workers, school and Public Health nurses and workers in the allied fields are availing themselves of the material offered relative to sight conservation and prevention of blindness. This course is offered in evening sessions at both universities. For detailed information address inquiries to the Office of the Secretary, Teachers College, Columbia University, 525 West 120th Street, New York City; Professor Helen C. Manzer, School of Education, New York University, Washington Square, New York City, or Miss Ruth B. McCoy, Director, Prevention of Blindness Service, New York State Department of Social Welfare, 205 East 42d Street, New York City.

The Royal Eye Hospital, London, gave an exhibition dealing with the prevention of industrial eye injuries on June 22, 1938. The exhibit was opened by an address by the Earl of Athlone, K. G. Mr. L. Vernon Cargill, F.R.C.S., and Mr. J. Minton, F.R.C.S., also gave addresses. The exhibition is to be permanent. The hospital also plans to establish a reëducation clinic to help the workman who has lost an eye.

Mr. Joseph Minton, F.R.C.S., gave an address on "Industrial eye injuries" to the National Safety Congress, London, May 26, 1938. The Royal Eye Hospital, London, takes care of from 50 to 60 workmen daily whose eyes have been injured while at work. Eighty percent are in the engineering and metal trades, others being in the building industries, chemical, and so forth. Infections are far less frequent now as compared to 10 years ago, for all cases are referred to the hospital, whereas formerly the corneal foreign bodies were removed by the foreman in the plant. In spite of improved conditions, industrial accidents account for about 10 percent of blindness. Stricter enforcement of preventive measures is recommended and education of the workman.

The Shrewsbury Eye, Ear, and Throat Hospital has added a new operating theater while the old one has been enlarged. The names of Swanzy and Russ Wood, who wo ked in Shrewsbury for 31 years have been given to these new rooms.

Societies

The British Medical Association, Section of Ophthalmology, at the annual meeting held in July was presided over by Sir Stewart Duke-Elder as president.

All communications to the new Council of the Ophthalmological Society of Egypt are to be addressed to the Hon. Secretary, 4 Baehler Street, Cairo.

The Chengtu (China) Eye, Ear, Nose, and Throat Society is prepared to meet at Chengtu after organization as of December, 1937. The president is Dr. Eugene Chan,

The New York Society for Clinical Ophthalmology announces the following officers: president, Dr. Percy Fridenberg, New York; secretary, Dr. David Alperin, Brooklyn. Meetings are held at 8:00 P.M. the first Monday of each month from October to May, inclusive.

The Fourth Annual Meeting of the Mississippi Valley Medical Society will be held at Hannibal, Missouri, September 28, 29, and 30, 1938. The three-day session is a postgraduate course for general practitioners. Dr. Claude Bruner of Columbia, Missouri, will present, "A practical and complete eye service."

The Seventeenth Annual Scientific and Clinical Session of the American Congress of Physical Therapy will be held coöperatively with the Twenty-second Annual Convention of the American Occupational Therapy Association, September 12, 13, 14, and 15, 1938, at the Palmer House, Chicago. Preceding these sessions, the congress will conduct an intensive instruction seminar in physical therapy for physicians and technicians September 7, 8, 9, and 10. The instruction seminar should prove of unusual interest to everyone interested in the fundamentals and in the newer advances in physical therapy. The faculty will be comprised of experienced teachers and clinicians; every subject in the physical-therapy field will be covered. Information concerning the convention and the instruction seminar may be obtained by addressing: The American Congress of Physical Therapy, 30 North Michigan Avenue, Chicago.

Personals

Dr. M. Uribe Troncoso has been appointed extraordinary Professor of Ophthalmology in the University of Mexico and has been invited to deliver a course of lectures and demonstrations on "Internal diseases of the eye and ophthalmoscopy" during four weeks in August of this year. The Department of Public Health in Mexico has also invited him to give a lecture on "Onchocercosis," the parasitic filarial disease now prevalent in the southernmost states of that country.

Do you have
your personal or
office copy of

THE SIGHT-SAVING REVIEW?

In our program of co-operation with ophthalmologists, we invite members of the profession to send for a complimentary copy of the June, 1938 issue, containing the articles listed below:

Report of the Committee on Conservation of Vision of the State and Provincial Health Authorities of North America

A. C. JOST, M.D.

Science Saves Eyesight

DONALD G. COOLEY

1937 Survey of Fireworks Accidents in Maryland

New Trends in Sight-Saving Class Activities

WINIFRED HATHAWAY

Eternal Vigilance—The Price of Good Eyes

E. CLIFFORD PLACE, M.D.

Visibility and Readability of Print on White and Tinted Papers

MATTHEW LUCKIESH, D.Sc.
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